BOYS AND BLENDED LEARNING: ACHIEVEMENT AND ONLINE PARTICIPATION IN PHYSICAL EDUCATION

A thesis submitted in partial fulfilment of the requirements for the

Degree of Master of Education

in the University of Canterbury

by Nathan Mark Walsh

University of Canterbury

2013

Table of Contents

Acknowledgements

I would like to acknowledge the people that have contributed to the completion of this study. Firstly, thank you to my supervisors, Julie Mackey and Niki Davis. Your content knowledge has been most valuable and I would not have been able to complete this research without your guidance and support.

Teachers in secondary schools are presently under increasing workload and time pressures and therefore I am extremely grateful to the teacher at School A who gave up a considerable amount of time to aid me with my research. Thanks also to the boys involved in the study.

Thanks to my family who have continued to support me throughout this experience. The discussions, counselling and proof-reading have been appreciated!

Thanks to my employer for granting me leave, the University of Canterbury for a UC Master's Scholarship and particularly the Ministry of Education for the study leave award. To be able to study full time for 32 weeks was a key factor in the completion of this study.

Abstract

The achievement of boys at secondary school in New Zealand has been a significant educational issue for decades. Many different approaches and initiatives have been used to raise boys' achievement. Using Information Communication Technology (ICT) for education is just one of these strategies. A developing body of literature suggests that using ICT to teach in a blended format can raise student achievement and there is also evidence to suggest that boys appear to participate at a higher level when ICT is used in education.

An action research approach was used to investigate my online teaching practice. A team teaching approach was used for teaching this blended learning module. Sixteen boys were taught a unit of work in a blended format based on a physical education achievement standard. Students were taught six lessons face-to-face in a traditional classroom setting and six lessons online using self-directed study in a computer lab setting. This study used qualitative data collection methods supported with descriptive statistics to gain an understanding of online module participation and NCEA achievement. In order to encourage participation, a social constructivist theory underpinned the design of the online module. Participants involved in the study were taught a unit of work in a blended format and completed a pre-course questionnaire. Following analysis of participation and achievement at the end of the online module, five students were selected to participate in individual post-course interviews. The results of this study showed that achievement of boys taught in a blended format was higher than that of students taught solely face-to-face. Findings also indicated a strong relationship between online module participation and overall achievement. Conclusions from this study revealed that student characteristics, technical difficulties, specific online activities and the role of the teacher, were important factors for the success of the unit of work taught in a blended format. Recommendations from this study may be useful to inform and guide future blended learning units of work within the secondary education sector — particularly for boys' schools.

Glossary

This section includes an overview of some key terms used in this research, clarifying their meaning for this particular study:

Table 1

Clarification of terms

Achievement	A result gained by effort, based on the quality of a student's work.
Blended learning	Blended learning is a hybrid of traditional face-to-face and online learning. Instruction occurs both in the classroom and online, and the online component becomes a natural extension of traditional classroom learning (Collis and Moonen, 2002).
ICT	ICT refers to information and communication technology. ICT is an umbrella term for a range of technological applications such as computer hardware and software, digital technologies, telecommunications technologies, as well as electronic information resources such as the world wide web and CDRoms (Selwyn, 2004).
LMS	A Learning Management System (LMS) refers to a platform of delivery for the online module. For the present study the *Moodle* LMS was used.
Online course	Within online learning, students learn via an online course where content is delivered through the internet. All the interaction and communication within the online course is conducted by using the internet and related communication tools such as email, discussion forums, audio and video conferencing (Sánchez, 2012).
Online learning	Online learning refers to using the internet in order to learn. Students access learning materials by interacting with content, the teacher, and other learners to acquire knowledge (Ally, 2004).
Online module	A unit of education presented in an online format. Several aspects of a broad topic are studied for a given period of time.

Online participation	Online participation refers to taking part and joining in a dialogue for engaged and active learning. Online participation is more than measuring activity counts. For the purposes of this study, participation will be defined as amount of activity, and quality of activity.
Sense of community	"…an acknowledged interdependence with others, a willingness to maintain this interdependence by giving to or doing for others what one expects from them, and the feeling that one is part of a larger dependable and stable structure" (Sarson, 1974, p. 157).
Unit of work	A series of lessons based on a specific topic. Often taught over a reasonably short period of time with an assessment at the conclusion.

Chapter 1: Introduction to the thesis

A continuing disparity exists between boys' and girls' academic achievement at secondary school in New Zealand. National Certificate of Educational Achievement (NCEA) statistics have shown a marked difference in gender performance since the introduction of this assessment in 2004 and lower educational achievement of boys has been evident since the 1970s (Fox, 2006). Lack of achievement at school can have a profound effect on boys in adulthood. Many young men frustrated with school, rebel and either drop out or are pushed out of school. Research indicates that there is a clear correlation between lack of education and crimes against society. Around 70% of the most serious youth offenders are not in school, and keeping them involved in education is the best way to reduce offending (Collins, 2012). In New Zealand, young men are over-represented in crime and prison; in 2006, 95% of prisoners under 20 were male (Irwin, 2009). It is therefore important to find new ways to engage boys at school and to raise their achievement.

The achievement of boys at the school in which the study was undertaken (School A) is consistent with the trend of boys' achievement nationally. More specifically, student achievement at School A for NCEA Level One Physical Education Achievement Standard 1.2 *(Demonstrate understanding of the function of the body as it relates to the performance of physical activity)* is very similar to the national male average. Since the inception of Achievement Standard 1.2 in 2005, students at School A have performed more poorly in this particular assessment (71% achieving) than any of the other five more practically oriented physical education achievement standards (81% achieving) (School A, 2012). Lower achievement for this particular achievement standard appears to be relatively consistent throughout New Zealand. In 2010 boys found Achievement Standard 1.2 to be the second most difficult assessment of the six offered in Year 11 physical education. This theory based achievement standard assessment requires a considerable amount of reading and writing, more so than any of the other more practically oriented level one achievement standards. The aim of this investigation was to improve the achievement of the boys in School A for NCEA Achievement Standard 1.2 assessment.

An action research approach was planned to investigate my current teaching practice with the aim of improving student achievement. I teach physical education at a large boys' secondary school and after ten years of experience, I have observed that digital technology and computers appear to engage boys inside the classroom. This observation led me to consider whether using ICT for learning could raise achievement. A pilot study I conducted in 2011 suggested that teaching using a blended learning strategy creates an opportunity for boys to improve their academic achievement for Achievement Standard 1.2. The American National Association for Sport and Physical Education also suggests that teaching physical education in a blended format is an effective teaching approach (ANASPE, 2007). Blended learning allows students to learn physical education theory via online lessons and the teacher can supervise the physical activity portion of a course, permitting live observation feedback

(Daum & Buschner, 2012). Thomas and Stratton (2006) found physical education teachers at secondary schools in England have welcomed the integration of ICT into physical education and consider the use of technology as a valuable tool in promoting effective teaching and learning. Chandra and Lloyd's (2008) investigation of blended learning at an Australian secondary school showed that students learning science in a blended format achieved higher final test scores than students who were taught solely face-to-face. Interestingly, the improvement was most significant with lower-achieving boys (Chandra & Lloyd, 2008). Wang and Reeves (2007) also found that American secondary school aged students were more motivated to learn Science when a web based learning environment was introduced to their classroom. Students expressed a desire to have more web based interactive lessons such as these. The present study will investigate whether a similar improvement in achievement could be brought about for New Zealand secondary school aged boys learning in a blended format.

In the current study sixteen boys were taught a unit of work relating to NCEA Level One Physical Education Achievement Standard 1.2 in a blended format for six weeks. Students were taught six lessons face-to-face in a traditional classroom setting and six lessons via an online module in a computer lab setting. A team teaching approach was used for the teaching of the unit of work. The students' usual classroom teacher taught all face-to-face and online lessons and was the 'up front' teacher. The researcher's role as a team teacher consisted of creating the online lesson material for the classroom teacher to teach during the online lessons. Online module participation data was analysed and matched with achievement to understand the relationship between online module participation and NCEA achievement. NCEA Achievement was measured via exam results in the end of topic final assessment, and participation was determined via the amount of student activity and the quality of student activity in the online module.

In order to promote participation and achievement, a social constructivist theory informed the design of the online module. Social constructivism refers to "knowledge construction by, for, and between members of a discursively mediated community" (Hruby, 2001, p. 51). I had had previous experience learning via fully online courses which had strong social constructivist underpinnings and had found this approach an effective method of encouraging participation and achievement. Several researchers investigating adults learning via fully online courses have reported clear links between participation and achievement (Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Morris, et al., 2005; Palloff & Pratt, 1999). For example Morris, Finnegan and Wu (2005) compared the participation and course completion statistics of 354 undergraduate students learning via an asynchronous online course. Participation was measured using frequency and duration of student access to the online learning platform and results showed a clear link between participation and course achievement. Rovai (2004) claims that students who participate with a stronger sense of community tend to possess greater perceived levels of cognitive learning. Based on research at the tertiary level, and my experience

of teaching boys, I therefore selected a social constructivist approach to encourage students to participate in the online module.

There are considerable differences in definitions of blended learning. Blended learning has been described by Ward and LaBranche (2003) as "learning events that combine aspects of online and face-to-face instruction" (p. 22). However, blended learning is more than simply teaching in two different formats. Garrison and Kanuka (2004) define blended learning as "the thoughtful integration of classroom face-to-face learning experiences with online experiences" (p. 96). Watson (2008) further defines blended learning as having a specific element of personalisation. He states, "Blended learning combines online delivery of educational content with the best features of classroom interaction and live instruction to personalize learning, allow thoughtful reflection, and differentiate instruction from student to student across a diverse group of learners" (p. 4). For the purposes of this study blended learning will be defined as a pedagogical approach involving the integration of online learning using computers and face-to-face learning in a traditional classroom.
The questions which guided this study are:

1. Can learning in a blended format raise boys' achievement?
2. What relationship exists between online module participation and achievement?

It is expected that the findings from this study will be useful to inform the pedagogy and content of future blended learning units of work at the school in which I teach. Findings from this action research investigation may also apply to other schools, particularly secondary level boys' schools.

Organisation of thesis

In this chapter a brief overview of the research rationale and context of the study has been provided.

Chapter 2 presents a review of the literature, outlining factors influencing the academic achievement of boys at secondary school, recommendations for best practice to teach boys are presented, particularly for physical education. Reasons for using ICT and blended learning to raise boys' achievement will also be presented. Informed by current and relevant literature, the review concludes with theory and principles underlying best practice in blended teaching and learning.

In Chapter 3, the methodology of the research is provided including a description of the action research approach, study design and method. An overview of the participants and setting, data collection methods and analysis and a discussion of the validity, reliability and ethical considerations of the research are also provided.

Chapter 4 presents the findings of the study, beginning with descriptive statistics of student achievement and participation. The second part of this chapter presents an in-depth investigation of a six-week unit

of work. Analysis of field notes, interview comments from students and the classroom teacher, and further descriptive statistics provide a rich description of blended learning in practice.

The research findings are discussed in Chapter 5. Specific activities within the online module were identified as beneficial for learning and several factors influenced the effectiveness of the blended learning approach. These factors will be discussed in relation to the literature.

Finally, Chapter 6 concludes this thesis by summarizing the main points of the study and providing recommendations for students, teachers and schools. Suggestions for future research will conclude the chapter.

Chapter 2: Boys' achievement and learning: Literature review

2.1 Introduction

This review of the literature examines the academic achievement of boys at secondary school and outlines reasons for boys' lack of achievement. A range of explanations has been identified in the literature to explain performances of boys at school. Several researchers have identified key recommendations for teaching boys, particularly in physical education. The use of ICT for education is just one strategy which may raise achievement. The suitability of blended learning to enhance boys' achievement will be reviewed and so too will the theory and principles underlying best practice in blended teaching and learning.

2.2 Boys' achievement at secondary school in New Zealand

A persistent disparity exists between boys' and girls' achievement at secondary school in New Zealand. National Certificate of Educational Achievement (NCEA) results have shown a marked difference in achievement since its implementation in 2004. At Level One NCEA, "a difference of seven to ten percentage points in favour of female candidates is evident in each year" (New Zealand Qualifications Authority, 2011, p. 23). A similar achievement trend in the final year of traditional secondary school education is also evident. In 2010 61% of boys achieved University Entrance compared to 70% of girls. Lower male achievement at school is not a recent trend, with evidence of higher achievement from girls being apparent since the 1970s (Fox, 2006). Statistics at single sex schools reveal a similar trend. Averaged achievement data across all year levels from 2010 showed boys at single sex schools achieved significantly lower grades than girls at single sex schools (New Zealand Qualifications Authority, 2011).

Because of the on-going achievement gap between boys and girls, raising achievement of disengaged boys and ensuring boys achieve their potential is a paramount issue recognised by the New Zealand Ministry of Education. In 2007 the Ministry of Education's Review Office conducted an investigation into the performance of boys in New Zealand schools. The report found "clear and consistent issues" related to the achievement of boys (Education Review Office, 2008, p. 3). Not long after, a website titled *'success for boys'* was created with the aim of helping schools create opportunities for all boys to succeed. Success for Boys is about taking steps to ensure all boys are engaged and achieving in their learning (Education Review Office, 2008).

2.3 Explaining boys' achievement

A wide range of literature attempts to explain boys' academic achievement. Researchers have identified many variables which can influence success. Noted factors include: the concept of masculinity (Francis, 2000; Kenway & Fitzclarence, 1997; McLellan, 2002); student ability (Hattie,

2003); the teacher (Irwin, 2009; Rowe, 2003); motivation to succeed (Legault, Green-Demers, & Pelletier, 2006) and socio economic status (Morgan, Farkas, Hillemeier, & Maczuga, 2009). This section will briefly explore these factors in relation to the proposed study.

A great deal of literature on boys' performance at school focuses on masculinity and the construction of male identity. Francis (2000) argues that "Loud, aggressive and/or disruptive behaviour is an integral expression of many boys' construction of masculinity ... and is likely to impede their achievement" (p.120). More specifically, many boys tend to behave as 'one of the lads', which involves displaying characteristics most associated with dominant forms of masculinity where performances are directed towards reputation and being identified as strong, cool and in control. Peer acceptance is an important consideration for boys and often peer acceptance is dependent on acts of *laddishness* of behaviour, risk taking and noisy demonstrations of masculinity (Kenway & Fitzclarence, 1997; Younger, Warrington, & McLellan, 2005). This often results in a calculated rejection of achievement at school (Kenway & Fitzclarence, 1997). Many authors also note that boys struggle to fit in with the expectations of schooling, where quietness and order are expected (Irwin, 2009; Lashlie, 2005).

Leading educational researcher John Hattie (2003) believes that student ability is the most important indicator of performance. He argues that individual student ability can account for about 50% of the variance of student achievement. Hattie acknowledges the importance of teachers, home life, peers, the type of school, and even the principal of the school, but believes that ability is the most accurate predictor of achievement. "The correlation between ability and achievement is high, so it is no surprise that bright students have steeper trajectories of learning than their less bright students" (Hattie, 2003, p. 1). This finding is reinforced by Kuncel, Hezlett and Ones (2001) whose investigation into achievement of secondary and tertiary students revealed that prior academic achievement was a powerful predictor of future success. For nearly thirty years, Feinstein (2003) examined ability in 17,000 children from the UK and compared this with achievement later in life. His research showed that measures of general development ability at a young age were a good predictor of achievement at 26 years. Children in the bottom quartile of achievement at 22 months were significantly less likely to get any qualifications compared with those in the top ability quartile (Feinstein, 2003).

Some researchers argue that the most significant factor in the success of academic achievement of boys at secondary school is the teacher. Altering classroom pedagogy can be a major determinant of student success. According to Irwin (2009), "Teachers have an enormous amount of discretion in their estimated that a student assigned consecutively to three highly effective teachers attained fifth grade mathematics scores as much as 50 percentile points higher than students assigned to a series of highly ineffective teachers. Rowe (2003) strongly advocates that the teacher and the quality of teaching are by far the most salient influences on students' cognitive, affective, and behavioural outcomes of

schooling. Further defining the teacher's impact, Hattie and Timperley (2007) explain that teacher's feedback is the single most important factor affecting student achievement. In a teaching setting, feedback needs to be clear, purposeful, meaningful, compatible with students' prior knowledge, and able to provide logical connections (Hattie & Timperley, 2007). As research indicates, the teacher also had a significant impact on student learning in the present study. Creating engaging content and delivering it in an effective manner were key aspects of the teacher's role which reinforced the importance of quality pedagogy.

Individual motivation plays a significant role in academic achievement. Legault, Green-Demers and Pelletier (2006) argue that:

> One of the most prominent academic problems plaguing today's teenage youth is a lack of motivation toward academic activities. Year after year, for reasons yet to be understood, numerous high school students find themselves in a state in which they do not have the desire to carry out the academic tasks required of them (p. 567).

Meyer's (2009) four year investigation into the motivational orientation of New Zealand secondary school aged students has identified a strong relationship between achievement and student motivation. Key research findings propounded two types of motivation orientations: *Doing My Best* and *Just Doing Enough* were strong predictors of future NCEA achievement. Meyer (2009) found the motivational orientation of *Doing My Best* significantly predicts higher achievement, while the motivational orientation of *Just Doing Enough* is associated with lower achievement. Females reported *Doing My Best* more than males, and males reported *Doing Just Enough* more than females (Meyer, 2009). Reasons given for a lack of motivation to succeed are often based around likelihood of success. If the task is perceived to be beyond the individual's capabilities, motivation decreases (Gorham & Millette, 1997).

Socio economic status is also commonly linked to boys' achievement. Research from the United Kingdom shows that underachievement at school is at its greatest amongst working class boys (Younger et al., 2005). Hanushek, Kain and Rivkin's (2004) investigation into Texas public elementary schools also showed economically disadvantaged students achieve less than more advantaged students. Reasons given for lower achievement include: low income, minority students facing higher teachers (Hanushek, Kain, & Rivkin, 2004). In New Zealand too there is a link between underachievement and social class, as Irwin highlights: "Study after study has shown that low socio- economic schools have the highest numbers of truant and underachieving students" (Irwin, 2009, p. 99). Although decile ratings at New Zealand schools are not necessarily an accurate indicator of economic circumstances of students, achievement at lower decile band schools reveals lower achievement levels. For example in 2010, 48% of students at low-decile schools attained NCEA Level one compared with 64% of students

at medium-decile schools and 73% of students at high-decile schools (New Zealand Qualifications Authority, 2011). School A is classified as a high-decile school and the general level of achievement is consistent with these New Zealand Qualifications Authority findings from 2010. Achievement data from previous years indicate that on average 71% of students achieved a pass grade or better in the achievement standard to be assessed in the present study.

2.4 Teaching boys

International research on the achievement gap between boys and girls frequently identifies literacy, especially writing, as a key area of difference between boys' and girls' achievement (Cuttance & Thompson, 2007). In most secondary school classrooms the ability to read, write and listen are essential to the learning environment.

> Schools love neatness, conformity, sitting quietly, and words, lots of colourful, descriptive words. These are things many boys struggle with. Schools must accept that boys need help; stop trying to squeeze them into four walls and a rigid timetable and create environments that can be more successful places for all our boys (Irwin, 2009, p. 41).

Gresham and Gibson-Langford (2012) argue that "The traditional approach of presenting boys with weighty course handbooks to read and asking them to complete hand written activities are at odds with contemporary research findings of how boys best learn" (p. 82). Research shows boys prefer practical hands-on learning, with pictures and movement. However the typical classroom setting is still that of a lone teacher at the front of the room asking students to predominantly listen and write. This mismatch leads to a frustrating educational experience for many boys (Gresham & Gibson-Langford, 2012).

Irwin (2009) surveyed 400 boys from a variety of New Zealand schools to understand how boys learn best. The results showed that boys preferred practical hands-on and interactive activities with relevant tasks, examples and practice. Visual learning was preferred and the opportunity to work co-operatively with clear explanations and expectations from the teacher (Irwin, 2009). Irwin recommends that a lesson for boys should incorporate visual stimulation as "it catches the boy's eye, especially if movement and colour are incorporated" (Irwin, 2009 p. 36). Boys should be taught in a manner which is interactive, fast paced and where competition exists in the classroom (Brown, Murphy, & Noble, 2001).

King and Gurian (2006), writing specifically about boy-friendly teaching strategies in the classroom, suggest teaching methods for boys should be influenced by educational research and also the biological construction of the male brain. Task oriented discussions and interactions with lots of physical movement access the boys' neurological strengths, keeping them energized and attentive (King & Gurian, 2006). Sax (2006) asserts that boys' visual systems are better at seeing action, so the teacher should move about the room when possible and because boys do not hear as well as girls, teachers need to speak in a loud voice to boys. Rowe and Rowe (2002) propose several recommendations for teaching boys:

- Highly structured instruction and lessons, with an emphasis on challenge and frequent changes of activity;
- Clear objectives and detailed but simple instructions;
- Short-term, challenging tasks and targets with frequent changes of activity; Immediate and credible positive reinforcement.

Good teaching practice was a key focus in the present study and many of these recommendations from Rowe and Rowe (2002) were implemented by the teachers in the assessed unit of work. Face-to-face lessons were always structured and challenging, while online module lessons contained simple instructions, challenging tasks and often gave students immediate feedback. All teaching content whether delivered online or face-to-face was focussed on activities and tasks that would appeal to boys. For example sporting heroes who had previously attended School A were often used as a way to help explain complex topics. All teaching was conducted by two teachers who are classified by School A's physical education appraisal system as experienced teachers. Both teachers have taught at School A for seven years or more.

2.5 Teaching physical education

There are various opinions of best practice in teaching physical education (Kulinna & Cothran, 2003). Pioneering leader of physical education pedagogy, Muska Mosston developed a spectrum of teaching which includes seven specific styles for teaching physical education. This spectrum includes a range of teacher-centred and student-centred teaching styles: Command, practice, reciprocal, self-check, inclusion, guided discovery and convergent discovery (Mosston & Ashworth, 2002). The type of teaching context, the teacher, and learner characteristics are all relevant and therefore no specific teaching style is recommended for physical education. The wide variety of students, content, and educational goals suggests that effective teachers should master multiple teaching styles (Mosston & Ashworth, 2002). Supporting Mosston and Ashworth's findings, several authors investigating physical education pedagogy have found a specific teaching approach may be effective in some situations. For example, Kulinna and Cothran (2003) found a teacher-led command style was appropriate for teaching practical physical education. Findings from 212 physical education

teachers from the United States, teaching in a variety of primary and secondary school settings, revealed that teachers' using a command style approach were highly effective teachers for skill learning. However, students did not enjoy this style of teaching in physical education and Boyce (1992) found the teacher-led command style teaching was associated with lower ratings for fun and motivation. Culpan and McBain (2012) recommend that physical education teachers are knowledgeable of socio-critical pedagogies. Student-centred approaches such as critical constructivism allow teachers of physical education to create shared experiences and facilitation of positive social interactions (Culpan & McBain, 2012). Gatman (2005) notes that a physical education teacher should act as a facilitator of learning and the Health and Physical Education Curriculum promotes a student-centred approach to teaching and learning. In the present study, all online module lessons were designed to emphasise interactions with others and student centred learning. Students were often asked to complete weekly tasks which involved discussing their thoughts, critiquing others' ideas and contributing to shared documents.

2.6 ICT and learning

Using computers in education can be an effective way to motivate students' learning (Belanger, 2002; Genc Ilter, 2009). In New Zealand, government funding and school spending has been focussed on bringing the education system into the digital age. "[t]he message is clear: New Zealand is moving towards a digital future, and schools are expected to play a major role in shaping and supporting this future" (Bolstad & Gilbert, 2006, p. 1). The New Zealand Government's document titled "Enabling the 21st century learner: An eLearning action plan for schools 2006 – 2010" (Ministry of Education, 2006) is an action plan which provides goals and a direction for the use of ICT in schools. It identifies the importance of developing today's students to be confident and capable users of ICT and to understand how to use ICT effectively across the curriculum.

> Just like the ability to read and write, ICT literacy will be an essential life skill – an economic and social necessity. Without [ICT literacy], there is a risk that people will be cut off from job opportunities and unable to take part in the full life of the community (Ministry of Education, 2006, p. 8).

Bolstad and Gilbert (2006) argue ICT has the potential to "help develop new kinds of curriculum and pedagogy that will both respond to and shape the 21st-century world" (p. 25). In addition to enhancing existing practices, the New Zealand Curriculum recommends schools should explore how ICT can open up new and different ways of learning:

E-Learning may:

- Assist the making of connections by enabling students to enter and explore new learning environments, overcoming barriers of distance and time;
- Facilitate shared learning by enabling students to join or create communities of learners that extend well beyond the classroom;
- Assist in creation of supportive learning environments by offering resources that take into account individual, cultural or developmental differences; and
- Enhance opportunities to learn by offering students virtual experiences and tools that save them time, allowing them to take their learning further (Ministry of Education, 2007, p. 36).

Using a blended learning approach was a new experience for almost all of the students involved in the study. This non-traditional approach to teaching allowed students to explore a new learning environment and possibly learn more collaboratively than what they would have in the traditional classroom. Exploring new and different methods of learning is an important aspect of 21st century teaching.

2.7 ICT and boys' learning

There is a growing body of research that shows ICT is motivating for boys (Gresham & Gibson-Langford, 2012; Lindsay & Muijs, 2006; Passey, Rogers, Machell, McHugh, & Allaway, 2004). Boys are often characterised as enthusiastic users of new technology and are more likely to spend more time on computers than girls (Gough-Jones, 2008; Littleton, Wood, & Chera, 2006). With ICT increasingly seen as a pillar of modern education, it is reasonable to assume that computers can play an important role in helping underachieving boys raise their standards (Haughton, 2002). Brown, et al., (2001) strongly encourage ICT as part of teaching and learning strategy to raise boys' achievement. Researching boys' achievement at secondary school in the United Kingdom, Brown, et al., (2001) claim the audio-visual element of using and finding information online is desirable for boys. Interestingly they also encourage the use of word processing for as many writing tasks as possible. West (2001) strongly supports the use of ICT for boys' education, recommending schools provide more opportunities for computer assisted learning and also more support and assistance for teachers who help boys to learn on computers. "Not only do boys enjoy their time on the computer; it is preparing them for the future" (Brown et al., 2001, p. 76).

Based on my teaching experience I have found using technology, particularly computers, to be engaging for boys at School A. Two previous pilot studies of units of work taught in a blended format showed promising signs of increased achievement for boys at School A. (Walsh, 2011). These studies were conducted in 2010 and 2011 with similar aged students studying the same unit of work. I also expected boys would be enthusiastic users of technology and would welcome learning in a blended format. This research further investigates my own previously conducted pilot studies, and contributes to the expanding body of blended learning research at secondary school in New Zealand.

2.8 Blended learning

The use of technology for learning is gaining in popularity and many educational institutions are increasingly adopting blended learning as a valuable teaching method (Vonderwell & Zachariah, 2005). According to Collis and Moonen (2002) blended learning is a hybrid of traditional face-to-face and online learning. Instruction occurs both in the classroom and online, where the online component becomes a natural extension of traditional classroom learning. Blended learning is a flexible approach which allows a teacher to offer onsite support, encouragement and face-to-face interaction, as well as the opportunity to learn independently (Oblender, 2002). This level of independence combined with the ability to guide and support students are one of the reasons why blended learning courses have been well-received (Melton, Graf, & Chopak-Foss, 2009). When creatively and effectively designed, a blended learning approach can be an ideal method for education (Garrison & Kanuka, 2004).

Blended teaching and learning is growing internationally and, in particular, in New Zealand (Zaka, 2012). In New Zealand schools, teachers are increasingly implementing online tools in their face-to-face courses (Roberts, 2009). In New Zealand, regional clusters of schools exist where students learn online and face-to-face in a traditional classroom. In the 'TaraNet' cluster of schools, the student roll has grown from 40 students and 12 classes in 2007 to 104 students and 21 classes in 2009 (Roberts, 2009). Teachers from these regional clusters are provided with opportunities to work collaboratively with other teachers to develop their skills and knowledge of blended teaching. This increased expertise enhances the learning experience for students (Parkes, Zaka and Davis, 2011).

One of the key benefits of blended learning is the shift from the teacher centred instruction to a more self-directed independent learning student. This encourages students to develop their 21st century skills by taking ownership of their learning (Boyde, 2012). The result is potentially a more robust educational experience than either traditional or fully online learning can offer (Rovai & Jordan, 2004). At the tertiary education level, potential benefits of blended learning over face-to-face learning include: increased achievement (Boyle, Bradley, Chalk, Jones, & Pickard, 2003; Dziuban & Moskal, 2001; Williams, Bland, & Christie, 2008); greater access to personalized learning (Albrecht, 2006; Moore, 2004); greater flexibility (Dziuban, Hartman, & Moskal, 2004); increased interaction and

sense of community (Rovai & Jordan, 2004) and reduced student withdrawal rates (Dziuban & Moskal, 2001). The body of blended learning literature at the secondary school level is not as expansive (Means, Toyama, Murphy, Bakia, & Jones, 2009) and further research is needed to inform practices in online and blended modes of education at secondary school age level (Barbour, 2010; Kachel, Henry, & Keller, 2005).

Teaching in a blended learning format is not without its challenges. Active teacher support for secondary school aged learners appears to be crucial when teaching in a blended format. Despite 21st century students labelled 'digital natives' by authors such as Prensky (2001) and Oblinger and Oblinger (2005), students are not necessarily ready to learn independently with technology, even in a blended learning format. Gaudioso, Hernandez-del-Olmo and Montero (2009) believe teachers in a blended learning environment play a crucial role as facilitators of the students' learning experiences. A teacher needs to monitor, understand and evaluate the activity of the students in the course (Gaudioso et al., 2009). Bolstad and Lin (2009) reported that many secondary school aged students in New Zealand learning in blended and online formats were not always ready to self-direct their learning. This was further evidenced by Parkes, Zaka and Davis (2011) whose study also investigated secondary school aged students learning in a blended format. The course teacher was surprised that students were unable to transfer their enthusiasm and expertise with technology across to the educational digital learning setting. The ability to have face-to-face interaction opportunities and also self-directed learning with onsite support can be very valuable to students of this age (Parkes et al., 2011).

2.9 Blended Learning and physical education

Thomas and Stratton (2006) found physical education teachers in England welcome the integration of ICT and view technology as a valuable tool to promote effective teaching and learning. ICT incorporated into the physical education curriculum at a United States secondary school has been well received by students and teachers who claim instruction has improved and student learning has been enhanced (Thornburg & Hill, 2004). Research conducted into the effectiveness of teaching physical education fully online at the secondary level has revealed mixed findings. Kane (2004) reported that some students indicated that they missed the face-to-face interaction with their teacher and had difficulty maintaining their self-designated pace. However, students enjoyed the flexibility of working on the course when and where they chose. Karp and Woods (2003) found physical education online instruction focused student learning and allowed for greater flexibility of learning. However, students had "problems navigating technology and were unclear about which content would be assessed, and missed contact with their teacher and peers" (p. 1).

McNamara, Swalm, Stearne, and Covassin (2008) examined teaching a physical education weight training course to secondary school aged students' in three different formats: face-to-face, blended, or

online. Findings showed that all groups significantly improved their academic knowledge; however, students in the online section failed to make significant gains in practical muscular strength. The absence of face-to-face interaction may have resulted in the lack of strength gains in the online section. It seems reasonable to assume then that social, emotional, and mentoring support may be crucial in motivating students to complete practical activities correctly to elicit a training response (McNamara et al., 2008). The American National Association for Sport and Physical Education recommend a blended approach to teaching physical education when teaching via online instruction (Daum & Buschner, 2012). This allows the teacher to supervise the physical activity portion of a course, thus permitting live observation and immediate verbal feedback. The present study used a blended learning approach where students could take advantage of the two different learning formats. Students learned new concepts in a direct face-to-face manner where there were plenty of opportunities to ask questions immediately of the teacher. These newly learned concepts were reinforced via the online learning lessons where students could work independently at their own pace.

2.10 Blended learning and achievement

Research on using blended learning as a strategy to raise achievement is encouraging, however most studies have been conducted at the tertiary level. Several scholars have suggested that switching from a face-to-face to a blended teaching format may result in improved student achievement and skill development for adult learners. For example, Williams, et al., (2008) found the replacement of the face-to-face course with a blended learning format resulted in an improvement in student performance and satisfaction. Investigating the introduction of blended learning in an undergraduate chemistry course in England, Williams, et al. (2008) found the "[a]verage module mark … improved from 49% to 59% when the blended learning module was introduced" (p. 47). The introduction of a blended learning module to replace a face-to-face format also resulted in improved achievement at an undergraduate physiotherapy course. Davies, Ramsay, Lindfield and Couperthwaite (2005) found learning online as well as face-to-face enhanced student skill and proved to be beneficial for students' preparation toward clinical placements. Students valued the opportunity to watch video clips of possible patients in order to help bridge the gap between their theoretical understanding and practical experience of the clinical setting (Davies et al., 2005). Melton, et al., (2009) also discovered similarly improved achievement results with blended learning instruction. Comparing achievement of undergraduate students studying a general health course revealed students taught in a blended format achieved significantly higher overall grades than their face-to-face counterparts.

Significantly less research has been conducted on blended learning and achievement at secondary education level. However findings also appear to be encouraging. Chandra and Lloyd (2008) conducted a comparative study at a co-educational state secondary school in Australia examining student achievement when learning in either a blended or face-to-face format. The study considered two cohorts of 15 – 16 year old students learning science in either a blended or face-to-face format

over two years. Both cohorts of students undertook the same semester program in terms of subject content. Using quantitative and qualitative methods, the authors showed that students learning in a blended format achieved higher overall test score grades. Interestingly, the improvement was most significant with lower-achieving boys (Chandra & Lloyd, 2008). Ng's (2008) observations and informal interviews with Year seven students learning in a blended format also revealed positive findings. Students learned science via a variety of web resources in their face-to-face classroom sessions. Results showed students enjoyed working on the computers in their class and that the interactivity of web-resources and self-paced learning were amongst the most important factors that increased student engagement. Korkmaz and Karakus (2009) found that a blended geography course improved secondary students' attitudes toward the course. The study group consisted of a total of 57 students at a Turkish high school. The experiment group was taught in a blended format using a website with various visuals and animations specially designed for the course. The traditional face-to- face learning model was used for the control group. Findings also showed the blended learning courses improved students' critical thinking when compared with the traditional face-to-face geography course. Wang and Reeves (2007), also found that secondary school aged students learning science were more motivated to learn when a web based learning environment was introduced to their classroom. From observations, student and teacher interviews and a student questionnaire, Wang and Reeves (2007) found that American secondary school aged students learning science were more motivated to learn when online learning environments included reasonably challenging activities, enabled learner control and stimulated student curiosity and fantasy. Students in the study also expressed a desire to have more web based interactive lessons such as these.

Blended learning and achievement research in New Zealand secondary schools is rather limited; however research literature has shown positive outcomes. Parkes, et al., (2011) found students learning NCEA level two home economics in a blended format developed many skills from the blended learning course. Developed skills included: higher order thinking, independent learning and increased self-management. Pratt and Trewern's (2011) study of New Zealand students' perceptions of blended learning at secondary school revealed that almost all students felt they became better time managers and independent learners from learning in a blended format. Both of these investigations examining the effectiveness of blended learning revealed that support for students appears to be vital for learning. Students in both studies valued the support from their supervisor, teacher or school. It is hoped that the present study will further strengthen New Zealand research findings on the connection between blended learning and achievement.

2.11 Best practice for teaching blended learning to boys

A broad range of factors can influence the blended learning experience. At the leadership level, Garrison and Kanuka (2004) recommend a formal approach to the development of policies and operations required to support blended learning. Garrison (2011) argues for 'collaborative leadership'

for the introduction of blended learning involving leaders at all levels to create commitment and ownership. Instructional design of a blended learning course is a crucial element for success (Troha, 2002). Understanding the students, their learning objectives and the content to be covered are important considerations when designing an effective blended learning course. Garrison and Kanuka (2004) suggest there is no ideal blend of online and face-to-face lessons. "A blended learning design represents … a fundamental reconceptualization and reorganization of the teaching and learning dynamic…" (p. 97). Hofman (2006) suggests kinaesthetic activities may be best taught in a traditional classroom while activities requiring memorisation and knowledge absorption might lend themselves best to being taught in a self-directed manner using online lessons. In addition, Hofman (2006) recommends face-to-face and online lessons should be linked together and built upon each other, and not treated as two separate teaching methods. In the present study, students learned six lessons in the face-to-face classroom and six lessons online. A 50:50 blended learning approach was chosen as my previous teaching experience and research literature indicated that this would be an ideal blend for boys of this age. Research literature has shown boys find the use of technology to be engaging for learning and my own personal experience indicates that working independently for long periods of time is often challenging for 15 year old boys.

There are few pedagogical guidelines for teaching a blended learning course; however teaching the online module of a blended learning course borrows some recommendations from best practice of teaching fully online. Jiang and Ting (2000) and Palloff and Pratt (1999) recommend a collaborative and reflective course environment where students can evaluate their own and each other's work. Swan (2001) recommends teachers of online modules should interact frequently and constructively, and hold valued and dynamic discussions when teaching online. Elbaum (2002) suggests teachers of online courses should develop rich, relevant activities for students and ensure they write in a friendly, positive and helpful tone.

Nicholas and Ng (2009), recommend that secondary school aged students are introduced slowly to a blended learning format and it is important to carefully develop student confidence. Providing students with adequate support and simple introductory tasks online, to gradually familiarize themselves, is recommended (Nicholas & Ng, 2009). Snart (2010) recommends the teacher of a blended learning course should be involved in the preparation and running of the online module. "Many faculty end up inheriting a course that is not theirs. As such, it does not reflect their particular interests, teaching style, organizational preferences, or tone" (p. 61). In order to effectively teach blended learning courses, Maddox (2009) recommends implementing professional development, mentoring, and coaching for all teaching staff embarking on a blended learning approach.

The blended learning course for students at School A was designed specifically for boys based on pedagogical guidelines for teaching a blended learning course, my own experience and knowledge, the New Zealand Curriculum, and recommended best practice ideas from the New Zealand

Educational Review Office. The New Zealand Curriculum recommends that effective pedagogy is based on: creating a supportive learning environment, encouraging reflective thought and action, enhancing the relevance of new learning, facilitating shared learning, making connections to prior learning and experience, providing sufficient opportunities to learn, and to inquire into the teaching – learning relationship (Ministry of Education, 2007).

The New Zealand Education Review Office's 2008 publication titled *'Boys' Education: Good Practice in Secondary Schools'* outlines 15 recommendations for teaching boys. Although reluctant to generalise to all boys in all schools, these guidelines are based on anecdotal or observational data. Boys should be taught via:

> practical, hands-on activities; the use of goals and targets; giving boys responsibility for their learning and allowing them to make choices; providing high levels of structure and teacher-led activities; positive reinforcement; using competition in the classroom; incorporating physical activity into learning; mentoring and peer support programmes; the use of outdoor education programmes; developing relevant learning activities and contexts; importing popular culture texts into classroom reading; daily silent reading times; using computers and other electronic media to support writing; developing critical literacy approaches, including those that help boys understand how masculinity is created through texts; and making school fun for boys and avoiding repetitive learning (Education Review Office, 2008).

I endeavoured to incorporate as many as possible of these guidelines into the design of the online module. Students learned from a structured online module environment where set tasks and activities were expected to be completed. However, students had many opportunities to choose how activities were to be completed, and in what order they were to be completed. Relevant learning activities with specific examples were used as much as possible and a great deal of positive feedback, as well as competition was used throughout the online module.

2.12 Student readiness to learn in a blended format

Although teaching in a blended format has the potential to enhance boys' achievement, literature shows that low student readiness to learn in a blended format could be a significant challenge (Bolstad & Lin, 2009; Parkes et al., 2011; Wright, 2010). Student readiness in this sense refers to preparedness of students to learn using computers. Although boys have historically been characterised as enthusiastic users of new technology (Gough-Jones, 2008), it is possible that boys will have a low readiness to learn physical education in a blended format. Yen and Lee (2011) collected data of the learning processes from 34 male and female students learning in a blended format at university in

Northern Taiwan. They found male students needed to develop self-control and self-motivation when learning online in order to be effective learners. Similarly McSporran and Young (2001) investigating first year undergraduate student learning in a blended format discovered that women achieved better results than men, and male students — particularly young males — appeared to need the discipline that classroom lessons provide.

Although research shows boys may face challenges when learning in a blended format; Gunn, McSporran, Macleod and French (2003) discovered that males may have high confidence in their overall online ability. Reporting on gender issues related to undergraduate students learning in a blended format at the University of Salford in England, Gunn, et al., asked all students to comment on the following statement prior to taking the module: "*I am apprehensive about using the online material*." Twenty nine per cent of females strongly agreed with the statement, whereas only eight per cent of males did. From this data researchers concluded males professed more confidence than females. In further discussions, males stated that they were very confident in their online ability and expected to enjoy using the online materials (Gunn et al., 2003).

There is limited research at the secondary education level about boys' readiness to learn in a blended format, however, students who achieve highly in fully online courses tend to demonstrate specific characteristics. Cheung and Kan (2002) discovered that a positive correlation existed between relevant academic experience and students' performance online, while Barbour and Reeves (2009) found successful online learners are independent learners with good time management skills and high internal motivation. Often cited characteristics of successful online learners include: interest in the material taught, self-motivation, independent and self-directed learner, critical thinker, family support, positive and timely feedback, accepts responsibility for own learning, organized, and practical knowledge in the use of computers (Irizarry, 2002).

In the present study, technology was used to attempt to raise boys' achievement. Despite research at the tertiary level claiming that boys may not be overly enthusiastic to learn in a blended format, I was confident that boys at school A would be enthusiastic for this method of learning. Based on my previous teaching experience, previous pilot studies, and my ability to create an engaging and effective online module, I was also confident that learning in a blended format could be responsible for raising boys' achievement. A key factor for success of the unit of work taught in a blended format would be the presence of the students' usual classroom teacher. He was present in all online and face- to-face lessons and his ability to motivate and provide structure for boys clearly enhanced the effectiveness of the blended learning course.

2.13 Support for students learning in a blended format

Teachers of blended learning courses play a crucial role supporting students. Teachers are facilitators of the students' learning experiences, in which monitoring, understanding and evaluation of the course are crucial to student success (Gaudioso et al., 2009). Parkes, et al., (2011) found New Zealand secondary school-aged students taught in a blended format felt the presence of a teacher was imperative. "All students interviewed admitted that focusing without the teacher's presence would be challenging, as she provided support and guidance" (2011, p. 19).

Zaka (2012) explains that teaching in a blended format changes the role of the traditional teacher from being the centre of the instruction towards facilitating student-centred learning. A good understanding of online pedagogy is an important aspect of teaching a successful blended learning course. "Even apparently simple acts like organizing online discussions into different virtual spaces, or even threading discussions in particular ways, will have significant effects on the nature of student interaction and on the discourse structures that result" (Nicol, Minty, & Sinclair, 2003, p. 279). According to Bonk, Kirkley, Hara, and Dennen (2000) the social aspect of an online course is an important indicator of the course's success or failure and Maor (2003) believes that it is the teacher's responsibility to support students by creating social interactions to achieve quality of learning. Although the role of the online teacher requires many specific skills and knowledge, some skills are similar whether teaching online or face-to-face (McKenzie & Roblyer, 2000). When teaching face-to- face, an important determinant of teacher effectiveness is based around the relationship with the student. The online teacher's ability to foster a friendly learning environment is important too. Relationship development, communication and collaboration are effectively encouraged and are a very important role of the online teacher (Bolstad & Lin, 2009; Hughes, McLeod, Brown, Maeda, & Choi, 2007; Parkes et al., 2011).

Schools embarking on a blended learning approach need to be aware of the technical and administrative support needed for students. Difficulties using computers or computer related issues beyond student control can negatively influence learning and have a significant impact on the success of the online aspect of a blended learning course. Technical difficulties during fully online courses have been associated with disrupted learning processes (Webster & Hackley, 1997); increased learner frustration (North, Strain, & Abbott, 2001); and dissatisfaction with the instructional experience (Wentling, Park, & Peiper, 2007). Technical difficulties were expected and experienced in the present study. Based on my experience with teaching using computers at School A, it was not uncommon for student learning to be disrupted by technical issues.

2.14 Online module participation and achievement

The two goals of this investigation are to examine online module participation and achievement. Studies of fully online courses reveal relevant insights into activities which influence online participation and achievement. Several studies have shown that the level online participation plays an important part in

overall course achievement (Bento & Schuster, 2003; Dantas & Kemm, 2008; Morris et al., 2005), however participation in specific online activities may be more beneficial for achievement. Two activities within an online module frequently identified as good indicators of achievement are discussion forums and quizzes. Davies and Graff (2005) argue that it is "The quality and dynamics of the interactions may be the more important influencing factors in learning and performance than simply the frequency of the interactions" (p.663).

Research at the tertiary level has reinforced the importance of discussion forums as an essential aspect of an online course (Stacey & Rice, 2011; Wilson & Stacey, 2011). The online discussion forum is valuable for learning because students can reflect on peers' contributions to increase their own knowledge. Students are likely to learn as much from one another in discussion forums as they are from course materials or lectures (Bates, 2005; Thomas, 2002). Effectively used discussion forums are an ideal way to create an environment where students can interact and be part of a learning community (Mazzolini & Maddison, 2003). Teachers of secondary school aged students from Michigan Virtual School found discussion forums maintained student engagement and motivated students to complete the online course (DiPietro, Ferdig, Black, & Preston, 2008). Similarly, Parkes, et al., (2011) discovered that discussion forum use improved students' higher order thinking skills and improved their use of language, symbols and texts. A study of secondary school aged students learning home economics in a blended format found "the forums enhanced language and literacy development and helped students move from understanding to applying, even analysing at some level…" (p. 12). Research in tertiary learning by Ellis and Calvo (2004) showed that students' approaches to discussion forums in online learning influenced their overall achievement in their final exam. Students with a positive and enthusiastic approach to discussions achieved higher grades than those students who did not participate in the discussions to the same extent (Ellis & Calvo, 2004). Morris, et al., (2005) noted that the time spent viewing discussions, and creating and responding to discussion posts is an important element of participation and a good predictor of final grades.

Although the research literature does not unanimously support the achievement benefits of online quizzes, several authors believe they are a popular and beneficial learning tool, which can help students evaluate their learning and focus their study (Dobson, 2008; Fritz, 2003; Itoh & Hannon, 2002). Furthermore, tertiary level studies have shown that the use of online quizzes can also be an accurate indicator of likely overall achievement (Dantas & Kemm, 2008; Padilla-Walker, 2006). In Dobson's (2008) investigation, formative online quizzes were introduced to an undergraduate exercise physiology course, it was concluded that using the online quizzes did enhance exam achievement and that average quiz score was a valid predictor of exam achievement. Similarly, Kibble (2011), investigating the quiz activity of 109 students during an undergraduate human physiology course, found a moderate but statistically significant correlation between quiz score and the examination. The most striking finding was that students who participated in the quizzes scored, on average, 13% higher on the

summative examinations than students who did not participate. Findings also showed non- participation in online quizzes was a consistent predictor of poor performance on summative examinations (Kibble, 2011). In addition to providing valuable feedback to the students, statistics from online quizzes may be used by the course teacher to identify and help students that are most likely to perform poorly on the summative exams (Dantas & Kemm, 2008).

Quizzes and discussion forums were an important feature of the online module for the present study. These two activities were easily incorporated into the design of the Moodle LMS as weekly tasks. I expected students would recognise the quizzes as an opportunity for valuable practice for the exam, and use the discussion forums to learn collaboratively from others. Quizzes were based on what had been learned previously and helped to introduce future topics, while discussion forums were designed to stimulate responses which involved ideas opinions and examples.

2.15 Defining participation when learning online

Participation has been argued to be an intrinsic part of learning (Wenger, 1998) and many researchers have attempted to understand factors which affect participation when learning online. Common factors identified are: course design (Tyler-Smith, 2006); the amount of technical support (Mitchell & Honore, 2007); learner background knowledge (Ross, 1996); previous experience with computer use (Kenny, 2002) and percentage of grade weight assigned to course activity (Jiang & Ting, 2000).

Historically, researchers' interpretations of the complexity of online participation have varied greatly and therefore participation has been measured in many different ways (Hrastinski, 2008). This following section describes examples from the wide spectrum of measures of online participation. Some studies have measured online participation at a rather superficial level such as frequency of accesses to group and communication areas, while other studies have measured participation at a much deeper level using various statistics and perceptions. For example, Davies and Graff (2005) examined participation of undergraduate students simply via the frequency of access to their online business degree course. Similarly, Yukselturk and Bulut (2009) measured the participation of students in a fully online tertiary computer systems course according to the number of messages posted to an online discussion forum. Morris, et al., (2005) on the other hand, examined the participation of undergraduate students learning fully online in much greater detail. Data collected on each student included which content pages were visited, what tools were used, and which discussions were read, created and replied to. Each piece of data included a timestamp that allowed researchers to calculate the amount of time spent on a task. Vonderwell and Zachariah (2005) also conducted an in- depth investigation of participation by measuring perceived and actual participation of graduate students in an online technology course. Participation data was collected via surveys, learner reflections and analysis of communication. More specifically, discussion messages were analysed for patterns of participation such as how the students responded to each other, in what order, and whether there was a pattern in the

way that the discussion worked. All students were allocated a participation grade according to their level of engaged and active learning.

As the above research indicates, there are many different ways to measure participation in the online aspect of a course; however a thorough review by Hrastinski (2008) found that research is dominated by low level conceptions of participation, which generally rely on frequency counts as measures of participation. Such measures of participation have been criticised because quantity statistics relating to time spent online and number of log ins may not necessarily reflect quality participation (Goertzen & Kristjánsson, 2007). Davies and Graf's (2005) conception of measuring participation via time spent logged in to a course site arguably indicates online access rather than online participation (Hrastinski, 2008). However, these quantitative measures of participation are useful to build an overall picture of participation. As Geer (2005) suggests, evidence from a quantitative analysis provides insight into work habits and patterns while examining discourse provides insight into interactive activity and cognitive behaviour.

Due to variations of measurement of participation in an online course, results of student participation have been mixed and difficult to generalise. Hrastinski (2008) therefore suggests the following definition of participation: "Online learner participation is a process of learning by taking part and maintaining relations with others. It is a complex process comprising doing, communicating, thinking, feeling and belonging, which occurs both online and offline" (p. 1761). This understanding of participation fits well with the key competencies of the New Zealand Curriculum document which expects New Zealand students to use of the skills of: "thinking, using language, symbols and texts, managing self, relating to others, participating and contributing" (Ministry of Education, 2007, p. 12).

In the present study, participation was defined as the amount of activity and the quality of activity. Participation in the online module was measured via: number of forum posts, number of responses to forum posts, number of quizzes completed, whether an assignment was completed, and total amount of LMS activity. Quality of activity was measured via weekly quiz score, assignment score and forum post score. Scores were allocated by me based on the Physical Education 1.2 Achievement Standard Exemplar's Achievement Criteria (See Appendix 20).

2.16 Social constructivist theory

I wanted to design a learning environment where students felt confident to participate and enjoyed the experience of learning via an online module. Many educational theories can be applied to online module design including behaviourism, cognitivism and constructivism (Anderson, 2008). Early computer learning based courses used a behaviourist approach for teaching where learning was regarded as a change in observable behaviour caused by external stimuli in the environment (Skinner,

1974). However, not all learning is observable and there is more to learning than simply a change in behaviour (Ally, 2004). As a result, there has been a shift toward more cognitive theories, which suggest learning results from inferences, expectations and making connections. Instead of acquiring habits, learners acquire plans and strategies, and learner prior knowledge is important (Hartley, 1998). Extending from cognitive learning theory is constructivism, which defines learning as students constructing their own meaning. Social constructivism is defined as "an epistemology/theory that emphasizes the idea that society and knowledge are produced by humans. Thus, knowledge is 'constructed' at a given time by people through collective or individual action" (Sullivan, 2009, p. 477).

Course content, assessment and learner characteristics are important considerations when determining a suitable guiding theory for planning any educational course. The current study drew on a social constructivist theory to inform the design features of the online module within the blended learning course. Students were regularly asked to complete activities which required inquiry, problem solving, and collaboration. Developing a sense of community was an important pedagogical goal for the online module as students with a stronger sense of community tend to possess greater perceived levels of cognitive learning (Rovai, 2002). Social tools such as online discussion boards, chat facilities and e-mail often found in online environments are used to support interaction and dialogue and are ideal for a socially constructed learning environment (Nicol et al., 2003). Research has shown mixed findings about the ability to create a sense of community for fully online learning (Hara & Kling, 2001; Haythornthwaite, Kazmer, Robins, & Shoemaker, 2000). Garrison and Kanuka (2004) note the value of blended learning to facilitate a socially constructed learning environment. The ability to simultaneously integrate independent and collaborative learning experiences with the rich dynamic of fast-paced, spontaneous verbal communication in face-to-face learning allows for a collaborative learning experience. Rovai and Jordan's (2004) investigation of tertiary education level blended learning suggests that blended courses produce a stronger sense of community among students than either traditional or fully online courses.

In this literature review the research context of the present study has been closely examined. More specifically research related to boys' achievement, best practice for teaching boys and the potential for technology to raise achievement and engagement for boys has been investigated. In the following chapter the methodology used in the study will be discussed.

Chapter 3: Methodology

3.1 Introduction

The current study examined online module participation and NCEA achievement of sixteen boys taught a physical education unit of work in a blended format. A team teaching approach was used during the six-week investigation to teach the content of a theoretically based achievement standard. Participation data was analysed and matched with achievement to understand the relationship between online module participation and NCEA achievement. All research is based on philosophical understandings about what constitutes 'valid' research and which research methods are appropriate for creating knowledge. This chapter discusses these philosophical assumptions as well as the research theories and design strategies underpinning this study. The interpretive paradigm was selected for the framework of the study and a social constructivist epistemology informed the research design. As a teacher investigating my own work, an action research methodology was adopted incorporating multiple data collection methods and thematic data analysis.

3.2 Interpretive paradigm

Blaxter, Hughes and Tight (2010) argue that a research methodology is composed of the underlying paradigm and project approach. "A paradigm serves to define what should be studied, what questions should be asked, and what rules should be followed in interpreting the answer obtained" (Ritzer, 1975, p. 157). Ponterotto (2005) explains there are numerous paradigms to guide research including: positivism, postpositivism, interpretivism, and critical theory. Each paradigm sets the context for an investigator's study and guides the researcher in philosophical assumptions and selection of tools, participants and methodology (Denzin & Lincoln, 2000).

The interpretivist paradigm was chosen for this study because it is primarily concerned with gaining participant perspectives and understanding of processes. An interpretive paradigm is concerned with obtaining descriptive data to understand perspectives, processes and how people negotiate meaning (Biklen & Bogdan, 2007). The interpretivist sees the results of research as an individual interpretation of fact, based firmly on a systematic approach to analysis and the maintenance of an open mind (Denscombe, 2002). Using this approach based on interpretation of fact can lead to the potential for researcher bias. No matter how rigorous the methods, the researcher may look predominantly for what he wants to see (Keen, 2005). Reducing researcher bias and maintaining validity will be further discussed in section 3.6.12. It is important to understand that using an interpretive approach means the findings from this research may not be generalizable to other students or schools. The inability to generalise does not detract from the value of the study as the rich qualitative behavioural and attitudinal findings have direct benefit to teachers, school leaders and students at School A. Furthermore, the detailed descriptions, in-depth analysis and final recommendations are likely to give value beyond the

immediate context of School A.

3.3 Epistemological stance: social constructivism

A social constructivist approach provided the epistemological underpinning of this research project. This sociological theory explains the acquisition of knowledge through groups collaborating and constructing knowledge for and with one another. Participants gain meaning from interactions and the environment (Sivan, 1986). The origins of social constructivism are largely attributed to early twentieth century Russian psychologist Lev Vygotsky. His investigations into psychology, child development and education resulted in many assumptions about how children learn, but he emphasised the importance of the social context of learning (Orey, 2002). Vygotsky's social constructivist theories stress the role of social interaction in the development of learning. Vygotsky believed that community plays a central role in the process of making meaning (Orey, 2002).

A social constructivist approach was an effective basis for the design of the online module. All teachers are guided by the New Zealand curriculum in which a social learning environment and interacting with others are crucial aspects of the curriculum vision. “Our vision is for young people who are ... able to relate well to others, effective users of communication tools, members of communities and international citizens” (Ministry of Education, 2007, p. 8). An appropriately designed module offers the opportunity to create a highly social learning environment, characterized by participation and interactivity (Brindley, Blaschke, & Walti, 2009). Research has shown that a constructivist and collaborative learning approach can be beneficial for learning online (Moller, 1998; Stacey & Rice, 2011). A good online module should foster a collaborative learning environment which encourages interaction with content, teacher and class mates (Maor, 2003; Stewart, Bachman, & Babb, 2009). Sharing of learning is not just restricted to learning from fellow class mates. The use of the internet in an online module can provide further information and examples which can be incorporated into the learning environment (Sthapornnanon, Sakulbumrungsil, Theeraroungchaisri, & Watcharadamrongkun, 2009).

As the online module designer, I focussed on a social constructivist approach for the creation of knowledge using a series of strategies and online tools which actively encourage interaction and collaboration. Laurillard (1995) recommends that course designers use discussions and promote interaction during the online learning process to encourage socially constructed learning. Weekly online module activities included discussion forums where open-ended questions were used to promote extensive dialogue among learners. The discussion forums and course design took into account prior knowledge, age, background, academic ability and interests. Providing encouragement, regular and timely feedback, and allowing for student reflection before contribution were key aims. Laurillard (1995) acknowledges that reflection takes time and effort. She warns that if the teacher gives little time for reflection, (s)he fails in providing the opportunity for the learner to construct new meaning

leaving, the learning process incomplete. Being respectful of inexperienced online learners and their potential to make errors was also taken into account.

3.4 Action research methodology

An action research approach was selected to achieve a deep understanding of my own teaching practice and to examine the participation and achievement of my students within a specific unit of work. Social psychologist and educator Kurt Lewin is often credited with coining the term 'action research' and used this term for the first time in 1944 to investigate social action (Ferrance, 2000; Smith, 1996). Kemmis and McTaggart explain action research as a deliberate, solution-oriented investigation that is group or personally owned and conducted. Action research is characterized by spiralling cycles of problem identification, systematic data collection, reflection, analysis, data-driven action taken, and, finally, problem redefinition. The linking of the terms 'action' and 'research' highlights the essential features of this method: trying out ideas in practice as a means of increasing knowledge about, or improving, curriculum, teaching, and learning (Kemmis & McTaggart, 1988).

Action research is an investigative procedure used to gather and analyse data that does not separate the investigation from the action needed to solve the problem (McFarland & Stansell, 1993). Action research is quite different to traditional research. Traditional research is usually conducted from an outsider's perspective, where the researcher stands outside the research situation and observes what other people are doing (McNiff & Whitehead, 2009). Action research recognises the role of the researcher as a practitioner, allowing for the insider to be part of the research. Among other things, action research is practice based, with the intent of improving practice, creating knowledge and improving learning. Action research requires people to hold themselves accountable for what they are doing and accept responsibility for their own actions (McNiff & Whitehead, 2009). Action research involves systematic cycles of planning, taking action, observing, evaluating (including self-evaluation) and critical reflection prior to planning the next cycle (McNiff, 2002; O'Brien, 1998).

Action research is now a common research approach for teachers. This methodology is used to understand and solve problems related to teaching and learning in schools and classrooms. Several authors have discovered that engaging in this type of research can also develop the teacher professionally and improve their pedagogy. Briscoe and Wells (2002) noted that benefits of conducting action research include teachers becoming more reflective, analytical, and critical of their own teaching. Baimba (1992) reported physics teachers conducting action research gained clearer ideas about aims and objectives of the curriculum and developed a better understanding of the nature and ways of acquiring knowledge. The process also allows teachers to model being reflective and proactive in addressing classroom issues and concerns (Field, 2010).

Traditionally used across many practitioner-related disciplines in the health and social sciences, action research gained attention and popularity in the field of education in the 1950's (Nolen & Putten, 2007). Stephen Corey from Teachers College at Columbia University was among the first to use action research in the field of education and emphasised the importance of educational practitioners conducting their own research in order to improve their actions. He believed that the contribution of action research to educational practices had been seriously underestimated (Harnett, 2008). Action research is different from other academic educational research as its aim is to understand and solve educational problems in schools and classrooms (Lim, 2007). Action research in an educational setting can take the form of a single teacher investigating an issue in their classroom, a group of teachers working on a common problem, or a team of teachers and others focusing on a school or district-wide issue (Ferrance, 2000).

The practice of action research is not without its criticisms. On-going debate grapples with the quality of teachers' action research. Issues of legitimacy of action research and the value of the knowledge generated have been raised. Deery (2011) argues that action research lacks rigour and validity and its findings are not able to be generalised. Other social researchers have also argued that the participation, democracy and external ownership aspects of action research may not lead to good, scientific, valid, reliable, usable research outcomes (Walter, 2009). In order to overcome the potential for lack of objectivity when researching your own practice, Deery (2011) makes several suggestions: clearly acknowledging your epistemological stance at the outset, having an advisory/validation group, conducting rigorous data gathering and data analysis, acknowledging the context specific nature of action research, and sharing and triangulating data. A further discussion on enhancing academic validity for this research investigation will be discussed in the validity section of this chapter (section 3.6.12).

Johnson (2005) suggests that gaining a thorough understanding of action research is also important before embarking on an investigation.

> In an action research project you are not trying to prove anything. You are not comparing one thing to another to determine the best possible thing. Also, there are no experimental or control groups, independent or dependent variables, or hypotheses to be supported. The goal is simply to understand. As an action researcher you are creating a series of snapshots in various forms and in various places to help us understand exactly what is going on (Johnson, 2005, p. 24).

An action research approach was used to investigate my own teaching practice with the underlying aim of improving outcomes for my students. Not only were my reflections within the study useful for improving my own practice, the overall results from this study offer insights that may be useful for

other curriculum designers planning future blended learning courses, particularly for secondary school aged boys. “Action research allows teachers to study their own classrooms — their own instructional methods, their own students, and their own assessments — in order to better understand them and be able to improve their quality and effectiveness” (Mertler, 2006, p. 4). Action research can be a collaborative activity where colleagues look for ways to improve instruction and increase student achievement (Ferrance, 2000). In order to develop an understanding of participation and how it relates to achievement, rich dialogue and discourse were encouraged during the interview data collection phase. The subjects of the research are not treated as objects but rather encouraged to be active participants in the research process (Coleman, 1995).

A particularly appealing aspect of the action research approach is the ability to self-reflect and alter pedagogy based on reflection. Active reflection is a crucial aspect of action research and the expectation is that practitioners will improve their own practices through learning from existing practices (McNiff, 2009). Shulman and Shulman (2004) believe regardless of teacher experience, the ability to critically reflect upon understandings and performances is the key to teacher learning and development. In action research, the researcher wants to try out a theory in real situations, gain feedback from this experience, modifying the theory and trying again (Avison, Lau, Myers, & Axel Nielsen, 1999).

Many authors have developed models of action research in order to help guide the researcher (Argyris, Putnam, & Smith, 1985; Cunningham, 1993; Whitehead & McNiff, 2006). All forms and models of action research are characterised by self-reflective enquiry undertaken by participants in social situations in order to improve their own practices (Carr & Kemmis, 1986). Some models of action research are rather stepwise in nature (eg. Tomal 2010, Smith 1996; see Figure 1 and Figure 2, Appendix 1) and are based around identifying a problem, and working through stages until a solution is reached. This step by step approach guides the researcher through set stages and is simple to follow with an obvious start and finish. However more detailed action research models allow for analysis and emphasis and do not assume that implementation is a straightforward process (Smith, 1996). Implementing the present action research investigation was unlikely to be a straightforward process. Unpredictable variables such as working with adolescent learners and the inherent everyday disruptions of schools means that reflection, analysis and alteration are essential components of this action research investigation.

The present study involved teaching a unit of work in a blended format over a six-week period. The most appropriate research design was a reflective and cyclical model, which allows for evaluation, rethinking and altering action before continuation. Figure 3 (Appendix 1) displays the chosen model from Somekh (2008, cited by Davis 2011). This model was chosen as it allows for checking and rethinking but maintains a structured process with a defined start and finish. The model allows the

researcher to develop strategies and act upon them, but also allows for rethinking, improving and changing.

3.5 Stages of Somekh's (2008) action research model

3.5.1 Investigating the current situation and planning how to start

My interest in enhancing the achievement of boys in physical education led me to explore the use of technology to aid learning. From many years of teaching experience, I have found that using ICT in class gains the attention of students. I wanted to determine whether teaching in blended learning can gain attention and play a part in raising student achievement. "A starting point for action research is best thought of as the first impression" (Altrichter, Posch, & Somekh, 1993, p. 44). When selecting a starting point for action research, Waters-Adams gives four rules for selecting a topic: "Keep it manageable, it should be interesting to you, it should be workable and it should not be too disruptive of normal routines" (2006, para. 1). This action research investigation was manageable as I was able to conduct the study at a school with which I was familiar (it was my place of employment). It was also manageable because I had received a study leave award from my teaching duties for the period of the study. This allowed me to fully focus on my research without the demands of full time teaching. Working with only one group of students from a single class over a limited period of time also added to the manageability of the project. Using ICT to aid learning is a genuine interest as I have used computers, mobile phones, cameras and video cameras in the classroom before and have previously taught two units of work in a blended format. I have completed post-graduate papers in best practice in online teaching and learning and also e-learning and pedagogy. I was very familiar with the resources, timetable and students at School A and the investigation was not disruptive of my or the students' normal routines. The planning process also involved choosing a colleague to be part of my research. This colleague would be a significant part of the research as they would be team teaching the unit of work with me. I carefully considered who I would choose and further details are discussed in section 3.6.6.

3.5.2 Beginning to introduce some changes and keeping notes and records

This step was used in several cycles of the action research process and initially was about narrowing the focus towards my research question. Accurate definitions of participation and achievement were paramount. So too was a clear understanding of exactly how they would be measured. My roles in this unique investigation as a team teacher, researcher, online module designer and pastoral care provider were important to define and adhere to. In later cycles of this step, I created the online module and introduced weekly changes and incorporated new ideas based on observations, field notes and LMS data. Although there was a wealth of information available from the LMS, keeping my own notes based on observation was extremely valuable. Hendricks (2009) claims that observational data is the most important source of information in an action research study and leads to a deeper level of

understanding. I observed all online and face-to-face lessons, wrote field notes and made notes on levels of participation within the online module, as well as how future changes could enhance participation and achievement. At the end of the investigation I identified participants for interviews based on their participation in the online module and NCEA achievement in the assessment.

3.5.3 Monitoring the impact of changes

I have taught this unit of work in a blended format twice in the last two years. I have made several changes to the online module and examined the impact of the changes, so I already had a reasonable understanding of which activities promoted participation. At the end of each week of the present study I reviewed the online module. My review was based on examining student log ins and online activity, in-class observations, and discussions with the classroom teacher. Each review resulted in changes and improvements to the online module. I carefully monitored these changes and the impact they had on student's participation.

3.5.4 Analysing and interpreting data to evaluate changes; planning next steps

Several forms of data were obtained during the online module. As I was present when the students were learning, I made my own observations and field notes in the practical setting of the computer room. I also had regular discussions with the classroom teacher about module and course progress. As well I observed the classroom based face-to-face lessons, taking notes on content taught by the classroom teacher and made my own notes about thoughts on student participation in this setting. At the conclusion of each of the weekly teaching cycles I reflected on individual student and class progress. Using the LMS reports feature, I gained accurate descriptive statistics on participants' log in frequency and individual activity. Data was analysed and interpretations were made to evaluate the effectiveness of the module, and whether future changes were needed. I planned future steps and made changes to the module as part of the weekly reflections afforded via the cycles of the action research model. The unit of work was taught over six weeks with a different topic each week. This allowed for six mini cycles of action research. I also developed my own 'feel' for how the online module was progressing. Reflection in action research must be critical, going beyond merely thinking about the experience — action that follows experience is a key element of reflection (Hendricks, 2009). Based on my experience as designer of this online module, I understood how the class was responding to activities and what future changes were needed. Reflecting on previous year's units of work allowed me to create a module which I felt students would find interesting and would be effective for their learning. This historical knowledge was invaluable as it resulted in fewer cycles through the reflection phases of the action research model.

3.5.5 Making knowledge public

This important stage involves sharing findings about best practice. This will be beneficial for other teaching staff and school leaders. Using action research to generate educational knowledge about practice, and sharing this with colleagues are key elements in producing lasting and sustainable change in schools (Hendricks, 2009). Making my knowledge public via departmental and staff meetings was well received by colleagues as the study was very relevant and timely. I also intend to present the conclusions and recommendations from this study at the physical education national conference in 2013 which will allow valuable feedback and critique. Sharing knowledge gained from this research will not only be valuable for others, it will also offer valuable personal and professional development. Conducting research on my own teaching practice increases personal insight and self- awareness, helping me to grow personally and professionally (Burns, 1999).

3.6 Research design and method

3.6.1 Ethics and Recruitment

After gaining approval from the University of Canterbury's Human Ethics Committee I wrote to the Head Master of School A and the Board of Trustees (Appendices 2-5). The Head Master was supportive of my project and gave me immediate approval, as did the Board of Trustees after their regular monthly meeting. After receiving consent and approval from School A, I met with the students with whom I planned to conduct the study. Students were informed of the project and their requirements for participation. Student and parental consent was obtained from 16 out of 17 of the students in the class (Appendices 6-9). Approval for participation in the study was also obtained from the students' usual classroom teacher (using the pseudonym Peter) with whom I would be team teaching throughout the research investigation. Accessing Peter's thoughts via regular discussion and post-course interview allowed me to gain a deeper understanding of the students' participation and achievement. The study was conducted between April and June 2012.

3.6.2 The school

School A is a high decile boys' secondary (Year 9 – 13) school with approximately 1200 students. The majority of students are New Zealand European and there is also a small percentage of Māori, Asian and students from other ethnic groups. School A has a history of encouraging technology for education. School A is part of the Greater Christchurch Schools Network, a member of the Kiwi Advanced Research and Education Network and was an integral member of an ICT Professional Development cluster focussing on boys learning from 2007 – 2009. Most teaching at the school is conducted in a face-to-face manner; however four staff within the school have previously taught units of work in a blended learning format. Approximately 10 other staff use the school's Learning Management System (LMS) as a tool for gathering student work submissions. School A's LMS is a free source e-learning software platform called *Moodle*. This internet based platform was used for the

online module throughout the investigation. There are approximately 150 computers with broadband internet at School A for easy student access at any time of the school day.

I chose to conduct my research at School A for several reasons. I was very familiar with this school therefore gaining access to classrooms, and ethical approval of students and teachers would be reasonably straight forward. My familiarity with the school also meant I was well aware of the timetabling issues and likely interruptions that may arise. As well I have a keen interest in the achievement of boys at secondary school and School A's overall level of achievement reflected that of national achievement statistics.

3.6.3 Participants in the study

Sixteen out of seventeen boys agreed to be part of the study. All boys were from School A, aged 14 or 15 years old and were studying Year 11 Physical Education. Boys were taught a unit of work in a blended learning format based on Physical Education Achievement Standard 1.2 (*Demonstrate understanding of the function of the body as it relates to the performance of physical activity*). All boys were from a range of academic and social backgrounds, and they had completed two years of secondary education. Student's prior knowledge of the function of the body was minimal. Only one student in the class had learnt in a blended format previously, (He had been part of a Year Nine French class in 2010 where the teacher used *Moodle* to teach several units of work in a mixture of approximately 30% online and 70% face-to-face format). Fifteen out of sixteen students in the study were of New Zealand European ethnicity with one student identified as Maori. This ethnic mix is a reasonably accurate reflection of the school's overall ethnic make-up. All participants in the study had internet access at home and free internet access at school. At School A all students have their own log in, password and internet account.

3.6.4 The unit of work taught in a blended format

All boys in the study were from a single class and were taught a unit of work based on Physical Education Achievement Standard 1.2. The achievement standard assesses three topics of anatomy, exercise physiology and biomechanics and how these relate to movement. Students were taught in a blended format twice per week for a total of six weeks. The first of the two lessons during the week was taught face-to-face in the classroom for 50 minutes by Peter. The second lesson of the week was an online lesson also taught by Peter using material that I had prepared. I was never the student's usual 'up front' teacher. This online lesson was also for 50 minutes and was taught in one of School A's computer rooms. All timetabled online lessons took place for all boys at the same time in a computer classroom. During these online learning lessons all boys had individual access to a desktop computer which was running Microsoft Windows xp Professional. Students involved in the study were required to be present in class during all online and face-to-face lessons. As the course progressed students were expected to complete tasks in their own time. Boys could access the LMS at

home or at school at any time. Table 3.1 presents an overview of the unit of work taught over a six-week period.

Table 3.1

Six-week outline of the unit of work taught in a blended format

Week / Topic	**Online lesson**	**Face-to-face lesson**
Weeks one and two: Anatomy	Student learning objective: Students to demonstrate an in-depth understanding of anatomical principles of the body.	
	Pedagogical aim: Students to participate in the online module and complete all online activities.	Pedagogical aim: Students to participate in classroom lesson and to complete all workbook activities.
	Structure of the topic: Using the Moodle LMS students were expected to complete online activities: update personal profile, post to introduction forum, post to discussion forums on the topics of muscles and bones used in particular movements, post to WallWisher.com activity about bones and movement, complete Moodle based quizzes on anatomy and exercise physiology.	Structure of the topic: Traditional face-to-face teaching, lecturing, some questioning and answers, copying from board, limited pair work and discussion. Students were expected to complete workbook activities: complete labelling of skeletal and muscular system from workbook. Complete muscles and bones and movements activities (refer to Appendix 21, pp. 137-141).
Weeks three and four: exercise physiology	Student learning objective: Students to demonstrate an in-depth understanding of physiological principles of exercise.	
	Pedagogical aim: Students to participate in the online learning module with a greater sense of community and complete all online activities.	Pedagogical aim: Students to participate in classroom lesson and complete all bookwork activities.
	Structure of the topic: Using the Moodle LMS students were expected to watch video clips and post to discussion forums on energy systems and exercise responses, contribute to shared revision document on what students have learned so far, complete Quizlet.com matching activities of energy systems and exercise responses. Complete Moodle based quizzes on anatomy and exercise physiology.	Structure of the topic: Traditional face-to-face teaching, lecturing, some questioning and answers, copying from board, mostly independent work and limited discussion. Students were expected to complete a revision quiz, complete workbook activities on energy systems and exercise physiology (refer to Appendix 21, pp. 142-147).
Weeks five and six: biomechanics	Student learning objective: Students to demonstrate an in-depth understanding of biomechanics.	
	Pedagogical aim: To have at least eight of the students' active in the LMS in their own time.	Pedagogical aim: Students to participate in classroom lesson and complete all bookwork activities.
	Structure of the topic: Using the Moodle LMS students were expected to complete Quizlet.com matching activities on motion, watch video clips and post to discussion forums on Newton's three laws, complete a biomechanics assignment using PowerPoint and upload to Moodle. Contribute to a shared revision document what students have learned so far. Complete Moodle based quizzes.	Structure of the topic: Traditional face-to-face teaching, lecturing, some questioning and answers, copying from board, some pair work and discussion. Students were expected to complete a revision quiz, complete workbook activities by listening to the teacher, and copying from board to fill in the blanks in their workbook (refer to Appendix 21, pp. 148-147).

The online module was updated at the beginning of every week with learning tasks and activities. Participants had one week to complete these tasks and activities. Boys were expected to contribute to online discussion forums, watch video clips, upload assignments, complete quizzes, and contribute to online notice boards. I used a variety of applications for this. Some were based within the Moodle LMS such as quizzes and forums, others included WallWisher.com, MapMyRUN.com, YouTube.com. It was important to use a variety of learning activities to appeal to different learning styles and to be specific to the needs of the students (Elbaum, McIntyre & Smith, 2002). Any activities not completed during class time were expected to be completed in students' own time. All material used in the online module was developed specifically for the module and the group of learners. The *Moodle* LMS recorded student's log in and their activity for the six-week period. Assessment of the achievement standard was via a hand written paper-based exam at the conclusion of the six-week unit of work.

3.6.5 Timeline

Boys were taught over a period of six weeks in a face-to-face and online format. Face-to-face lessons were taught in a classroom on Wednesdays 25 April, 2, 9, 16, 23 and 30 of May. Online lessons were taught in a computer room on Thursdays 26 April and Thursday 3, 10, 17, 24 and 31 of May. Boys were expected to be present in class on these dates. In addition, they were free to access the online module at any time in their own time.

3.6.6 Researcher's role

Based on the chosen methodology of this study, I had several different roles which I needed to carefully balance. It is important to make any biases clear that may be associated with these roles. My roles as researcher, teacher, team teacher, online module designer, and at times pastoral care provider were all influential factors on the design and outcomes of this study. Firstly, the role of an action researcher is quite different to that of a traditional researcher. Because action research is always done by practitioners within a particular situation, the researcher is inside the situation. The researcher will inevitably influence what is happening by their presence (McNiff & Whitehead, 2009). As an action researcher my main role was to investigate my teaching and attempt to improve my practice. Although an action researcher is likely to impact on their investigation, I used this stance to my advantage. As a well-known teacher who has a good relationship with the boys in the study I was able to gain valuable data. I was able to draw out descriptive information from the teenage boys to create new knowledge which I may not have been able to do, had I been an outsider to the study. Conducting my study in a professional manner, where the research methods did not interfere with my teaching practice was also paramount. "The challenge in planning action research is to make the methods transparent" (Zeni, 2009, p. 258). This high degree of responsibility within the investigation is consistent with the action research process. Action researchers make their own decisions on what is important and what should be done.

Although I was well known to the students as a teacher at School A, my role in this investigation was primarily as the online module designer. I was never the 'up front' teacher in any of the online or face-to-face lessons. The first time I met with the boys involved with the study I explained to them that I would not be their teacher, and would only be present as the online module designer and researcher for a short time. My role for this project was quite different to what I was used to and probably quite different to the usual role of a blended learning teacher. I was on leave from my position as a classroom teacher for the duration of the study; therefore I did not have the usual tasks and demands of a typical classroom teacher. My role as online module designer allowed me the luxury of contributing a great deal of time and effort to creating and maintaining the best online module possible without the commitments of teaching other classes.

As an online module designer, I was part of a team teaching arrangement with Peter. I had specifically asked Peter (who is a fellow physical education teaching colleague) if he would be part of my research project. I was very pleased when he agreed. His organisational skills and open mindedness were crucial for the smooth running of the project. Before we began teaching the unit of work, we discussed our approach to this unit and defined our roles. I reassured Peter that he would be the class's main teacher throughout the project. He would teach as he normally would during face-to- face lessons, and in online lessons he would teach using material that I had prepared. During online lessons Peter's basic role was to support and guide students. Specifically, he dealt with various issues such as monitoring student attendance and answering content specific questions. Peter's role during the online lessons was quite different to his role in the face-to-face lessons. Oliver (1999) explains that with online learning the teacher's role is no longer the centre of attention and knowledge, but instead provides the learners with access to a variety of independent learning experiences. Peter and I were physically present in all lessons whether online or face-to-face. Peter and I were content expert teachers and students could communicate with us at any time.

By attending all of the face-to-face lessons, I ensured that the material I prepared for the online module did not overlap or contradict Peter's teaching. When present in the face-to-face lessons, I sat at the back of the room and took notes on content covered and made observations on student participation. During the online lessons, I also sat at the back of the room and took notes on student participation and effectiveness of the online module activities. During the face- to-face and online lessons, the classroom teacher did the 'up front' teaching – performing all teaching and administration tasks as well as assisting students where necessary. I only assisted the students on rare occasions if the classroom teacher was unavailable or unable to assist.

I considered myself reasonably experienced as an online module designer. I had previously taught two units of work in a blended format and I was confident in my ability to create a module which would be engaging and valuable for the students. Module design was based on previous modules, student

interests, age and trending sporting events. On average I spent about four hours per week designing, reviewing, responding to and marking the online module. As the online module designer I could access the LMS reports and gain a great deal of information on student participation in the online module. Observing and listening to students also allowed me to gain a clear picture of module progress.

Another significant role in this research investigation was that of pastoral care provider. I was familiar to all of the students involved in the study and there were several students whom I had taught in the past. I knew most of those students' parents, interests, friends and academic ability. Due to being well known to most students and to my previous role assisting with a guidance programme, I knew a great deal about some specific students. My pastoral care background was probably beneficial at the end of the course as students may have been more likely to discuss their thoughts openly in the post-course interviews. "For a more complete understanding, one needs to become to some significant extent a participating member of the classroom community" (Wells, 2009, p. 52). Each of these different roles which I balanced throughout the study posed challenges and will be discussed in further detail in Chapter Four.

3.6.7 Data sources and data collection

A qualitative approach was used for this investigation, however the multiple qualitative methods employed to collect data are supported with descriptive statistics. Qualitative data collection methods included: pre-course questionnaire, post-course semi-structured individual interviews, on-going discussions with Peter and my own observations and field notes. Supporting descriptive statistics were obtained via LMS reports.

The first standardised pre-course questionnaire (see Appendix 12) was given to all sixteen students in the class immediately before beginning the unit of work. The pre-course questionnaire consisted of specific open-ended questions to investigate students' technology skills, perception of online and blended learning; and to gain a prediction of their likely participation and achievement. This questionnaire was completed individually in a classroom setting.

The post study semi-structured individual interviews (see Appendix 15) consisted of open-ended questions carefully designed to elicit boys' ideas and opinions on their participation and achievement in the blended learning unit of work. All questions were designed to be easily answered and were piloted with a teacher who was not part of the investigation. Post-course interviews were conducted within one week of the conclusion of the six-week unit of work at a prearranged time outside of classroom teaching hours. Individual interviews were conducted in a quiet private classroom and were audio recorded to ensure accuracy. A microphone and laptop computer was used to record and store the interview. The computer software *Audacity Digital Audio Editor* was used to aid recording and a

mobile phone with voice recording capability was also used as a backup device. The recording ensured accurate documentation of the interview and was conducted with the student's full permission. The student's online material from the LMS was used as a prompt to the conversations. Each of the five students were interviewed once and the interview took no longer than twenty minutes. Students were asked the same open-ended questions and the semi-structured nature of the interviews enabled me to ask extra discretionary questions to gain more detailed information, or pursue or clarify a point where necessary. Although non-verbal behaviour such as body language or facial expressions could not be recorded, tone of voice, expression and volume all provided valuable information to assist with interpretation. I conducted all interviews and personally transcribed them to ensure the most consistent interpretation possible.

My own personal observations and field notes throughout the research project provided a valuable source of information. Field notes were collected during six cycles of research comprising twelve separate classroom and computer room lessons. Field notes (excerpts provided in Appendix 14) were written during each online and face-to-face lesson. The field notes were in the form of a running record of everything that happened during these twelve lessons. These included continuous running commentaries, detailed descriptions and verbatim comments from the teacher and students. Field notes were expanded at the end of the day where necessary. I also added my own thoughts to the field notes when marking or creating the LMS outside class time. I also noted problems, issues and emerging trends as they arose.

Another important source of data was from the report function of the LMS. This provided valuable participation data on the amount and quality of activity in the online module. Using the LMS to gain valid and reliable data is an unobtrusive and increasingly popular data collection technique for computer based courses (Romero & Ventura, 2007). The reports feature of the LMS revealed a wealth of information about student activity within the online module. I specifically examined participation in discussion forums, quizzes, and an assignment. The report function from the LMS divulged information including: student's name, component of the module accessed, date and time of access, activity type (view, add, update, delete) for each online action, and the IP address of the computer accessing the LMS. These activity reports were extracted from the LMS at the end of each teaching week and saved into a Microsoft Excel spread sheet.

3.6.8 Measuring online module participation

For the purposes of this study, participation was defined as the amount of activity and the quality of activity. When measuring online participation, I examined the amount of activity via: number of forum posts, number of responses to forum posts, number of quizzes completed, whether an assignment was completed, and total activity in the LMS. Quality of activity was measured via weekly quiz score, assignment score and forum post score. Scores were allocated by me based on the

Physical Education 1.2 Achievement Standard Exemplar's Achievement Criteria (See Appendix 20). Table 3.1 displays a rubric for grade allocation:

Table 3.1

Rubric of grade allocation for online activities

Score	Criteria for quiz score	Criteria for assignment score	Criteria for forum post score
10	Correct with details and/or examples	Submitted, all questions specifically answered correctly	Post relevant and specific
7,8,9	Correct, but lacking specific details	Submitted, some questions specifically answered correctly	Post lacking specific details
4,5,6	Correct, basic answer	Submitted, some questions answered correctly but lacking detail	Post gives basic contribution
1,2,3	Incorrect but reasonable attempt made	Submitted but incomplete	Post incorrect or vague in contribution
0	No submission	No submission	No post

A wealth of information can be gained from the LMS. My own observations, journal entries and feedback from Peter added to the amount of available data. Carefully selecting appropriate data without overloading and complicating the findings is a potential problem in data analysis and interpretation (Trochim & Donnelly, 2001). Measuring online module participation based on the above methods of data gathering was influenced by the literature review, research questions, the range of data available and the time and other resources available.

LMS data provided useful feedback for planning and teaching the online module. This data gave a good overall indication of student participation. A much deeper understanding of online module participation was needed at the conclusion of the module to help explain student participation and achievement. Using low level completion measures of online activity does not give an accurate picture of individual participation or learning (Hansmann, 2006; Hrastinski, 2008). Therefore in order to gain a more precise understanding of participation, five students were interviewed to gain rich explanations of their thoughts and activity about the online module. This qualitative material was invaluable for the analysis and gave strength to the online activity data from the LMS. As Mackey (2009, p. 180) states "Qualitative analysis helps to understand student learning and critical thinking in a social context". Researchers should collect multiple data using different strategies, approaches, and methods so that the resulting mixture or combination is likely to strengthen the research outcomes (Johnson & Onwuegbuzie, 2004). Interviewed students were selected based on levels of participation in the online module and NCEA achievement. This is further explained in section 3.6.10.

3.6.9 Measuring achievement for all students

Achievement in the assessment was based on a paper exam at the end of the six-week unit of work. The assessment for Achievement Standard 1.2 was created by School A's physical education department based on a recommended exemplar for this assessment from the Ministry of Education. The assessment was not marked or graded by me or Peter, but by another member of School A's physical education department. The assessment was then moderated for consistency and accuracy by another member of School A's physical education department. Students were allocated achievement grades according to School A's physical education department's marking schedule.

NCEA achievement was classified into three areas defined by NCEA grade boundaries:

- Very high achievement: Excellence final grade
- High achievement: Merit final grade
- Moderate achievement: Achieved final grade
- Low achievement: Not Achieved final grade

3.6.10 Matching participation to achievement

Five cases were purposefully selected for further investigation:

- Two students who participated to a high level in the online module and achieved a very high achievement grade
- One student who participated at a low level in the online module and achieved a high achievement grade
- One student who participated at a high level in the online module and achieved a moderate achievement grade
- One student who participated at a low level in the online module and achieved a lower grade

3.6.11 Data analysis

Analysis of data is the process of inspecting, organising and reducing data so that the researcher can bring meaning and suggest conclusions (Marshall & Rossman, 1995). Participation data extracted from the LMS about student activity and quality of activity were reasonably straightforward to collect and analyse. Data were collected weekly via the reports function of the LMS and once collected were transferred to a Microsoft Excel file for analysis. Here I analysed patterns of online module participation. Notes were made and questions posed about existing trends and aspects which appeared to be interesting or important. This reflective information was extremely valuable and used to plan the following week's activity on the LMS.

I personally reviewed and transcribed all of the field notes and observations. This was completed at the end of each reflective cycle while thoughts were still fresh in my mind (see Appendix 14 for an

example). This information was valuable evidence and enabled me to act upon interesting points and trends and to adjust the online module at the end of each reflection as necessary. The qualitative data obtained from the pre-course questionnaire and post-course interviews were slightly more difficult to analyse. Qualitative data analysis is the processes and procedures of transforming data collected into some form of explanation, understanding or interpretation of the people and situations under investigation (Lewins & Gibbs, 2010). The pre-course questionnaires were analysed for trends and consistencies and results can be seen in Appendix 13.

Although only five students were interviewed, the volume of information produced from even a modest number of interviews can be considerable (Menter, 2011). I Used Mertler's (2006) inductive process to analysed the qualitative interview data. I made specific observations and noted patterns in the data, formulated one or more tentative hypotheses, and developed general conclusions.

In order to ensure the accuracy of collecting and sorting data gained from interviews, Menter recommends the following sequence:

> Codes: producing labels that allow the key points of the information to be highlighted.
> Concepts: collections of codes of similar content that allow the data to be grouped, compared and contrasted.
> Categories: broad groups of similar concepts that are used to generate a theory.
> Theory: a collection of explanations that explain the subject of the research (Menter, 2011, p. 95).

3.6.12 Validity

"Validity refers to the degree to which scientific observations actually measure or record what they purport to measure" (Pelto, 1978, p. 33). Action research methodology has been critiqued by previous scholars (Eden & Huxham, 2005; McKay & Marshall, 2002). In particular Eden and Huxam (2005) question the quality and validity of action research, as the research is conducted by teachers and not academics. Therefore it is critical for the action researcher to ensure that the research is sound. To ensure the validity and academic rigour of the research process, Hendricks (2009) recommends several strategies: utilize peer debriefing, engage in persistent and prolonged observations, be sure to record data accurately, triangulate data sources, provide thick description of the setting and study, make clear any researcher bias and present results to key audiences.

Peer debriefing refers to discussing the study with a colleague or peer in order to provide alternative interpretations and assist in formulating new study directions. Regular weekly discussions and a formal interview with Peter as well as periodic meetings with research supervisors have meant that the investigation has been through several cycles of opinion. As Hendricks (2009, p. 144) observes, "One

person's interpretation of these data may be much different from another person's interpretation". Vigilant observation of student behaviour in the face-to-face and online lessons has also produced valuable data. Data were carefully recorded via hand written field notes, voice recordings, online electronic documents and the LMS. Carefully collected data from a variety of settings ensures accuracy and allows for corroboration and triangulation of findings. Data for this study were collected from pre-course questionnaires, LMS statistics and qualitative data from interviews, field notes, observations and discussions with Peter. Corroboration of data allows supporting research from one data source to support results from another data source (Hendricks, 2009). Pre-course questionnaires gave an indication of likely student participation, while data from the LMS throughout the online module gave a 'real time' indication of participation. Similarly, the detailed post-course qualitative interviews allowed for explanation of participation and achievement. A description of the students involved, the setting and the study was provided earlier in this chapter as was my own personal standing in this study. Presentation of findings at School A and also at national conference level is planned and forms an important part of Somekh's (2008) action research cycle.

3.6.13 Ethical considerations

Ethics guide the researcher and ensure all participants in the study are protected. Ethics apply in all areas of the research process, from invitation of participants, reporting findings, examining data, publishing, and even how information is stored after the research is completed (Abbiss, 2011). While pursuing an inquiry, the researcher usually exerts some power over the participants, and this is particularly relevant when working with adolescents. I was well known to the students involved in this study and have taught some of them in the past. I was in a formal position of power and students were young and potentially vulnerable to exploitation and coercion. I was well aware of my action researcher 'insider' role and the responsibility this stance brings. I ensured all ethical principles were adhered to and as Zeni states, the bonds of caring, responsibility and social commitment that engage action researchers may be the most appropriate basis of ethical decision making (Zeni, 2009). The following section discusses the ethical considerations of my research and also outlines themes of responsibility/accountability, action/social justice, and caring/respect specific to an action research approach (Zeni, 2009).

Upon approval from the University of Canterbury's Educational Research Human Ethics Committee permission was gained from School A's Head Master and Board of Trustees. The investigation adhered to all principles and guidelines for educational research. The principles are: informed and voluntary consent, respect for rights of privacy and confidentiality, limitation of deception, minimisation of risk, and obligations under the Treaty of Waitangi.

The principle of informed and voluntary consent ensured research participants were not coerced into participating in research; that they were participating of their own free will and could withdraw from

the study at any time without fear of repercussions. This was particularly relevant in my study as students are often 'captive audiences' for research and may feel bound to participate. “No matter how well intentioned the teacher, students may feel compelled to participate, believing that failure to do so will negatively affect their grades and the attitude of the teacher (and perhaps other students) toward them” (Office of research, n. d.). I mitigated the risks of informed and voluntary consent as much as possible. The potential participants in the study are aged 15 or 16 and are classified as ‘young people’ therefore three forms of consent were required. All potential participants were given an information sheet, and participant consent form. Information sheets and consent forms were also sent home for parents of the students. Consent was obtained from the Head Master and Board of Trustees at School A. All participants received information sheets and consent forms before beginning the course. (See Appendices 2 – 11 for copies of all consent forms and information sheets.) Students only participated in the research if the student and parental consent forms were signed and returned. All of the information and consent forms were distributed by a third party to reduce coercion. Students who chose to participate in the research study were able to opt out of the study at any time while continuing to fully participate in the unit of work without influence on their learning or grade.

Respect for rights of privacy and confidentiality not only maintained validity of the research but also protected those involved in the study. Privacy refers to the wish to remain unnoticed or unidentified in the public realm. Meanwhile confidentiality in educational research is an extension of privacy and refers to the researcher being able to identify a certain person’s response but promises not to make the connections publically (Tolich & Davidson, 1999). Tolich and Davidson (1999) also add that as New Zealand is a small country, researchers may be required to take extra care to go to greater lengths to ‘hide’ facts in a study in order to protect participants or reputations. Collection, storage and use of information are important issues in educational research. Information obtained from participants remained confidential, so too did the identification of the institution in which the study was held. I only collected information specifically relevant to the study and all consent forms and questionnaire and interview responses were securely kept by me at the College of Education Post Graduate study centre. Access to this data was restricted to me and my research supervisor. The University of Canterbury Educational Research Human Ethics Committee requires that all material collected is securely stored for five years after which it is destroyed. In this research investigation complete privacy and confidentiality could not be guaranteed for student responses to discussion posts. These responses were seen by all class members as sharing of discussion post responses was an important method of learning in an online module. At the conclusion of the research all discussion post responses were removed from student access. During the analysis and reporting of results, pseudonyms were used for all participants and the institution, so that privacy and confidentiality could be maintained. The researcher was the only person with the matched list of names and codes.

Deception refers to causing one to believe that which is not true (Sieber & Stanley, 1988). Deception can occur whenever investigators intentionally communicate in a way that produces false beliefs in the participants (Wendler & Miller, 2004). Intentional deception has no part in this study. I ensured I communicated clearly, openly and honestly to all involved in the study.

Minimisation of risk refers to protecting the researcher and those involved in the study. In the present study, extra care was taken as the research involved younger people. Harm can also be psychological, such as when people are made anxious or lose their self-esteem. As Snook states "When working with children … great care needs to be taken to ensure that no harm comes to their young psyches" (Snook, 2003, p. 163). There were no foreseeable risks or any offence caused to the participants or myself. Finally, research was conducted in a respectful manner so that participants' attitudes and beliefs were valued at all times. Investigations involving participants from different cultures require specific principles to be followed. Research conducted in New Zealand must consider the underlying principles of the Treaty of Waitangi. One participant involved in the study was identified as of Maori ethnicity. It was important to consider this when conducting this investigation. Kaupapa Maori research is specific to Maori people of New Zealand and is about understanding of Maori people, sharing gained knowledge and not judging. Cram recommends seven guidelines about Maori research ethics some of which include: meeting, looking and listening to people being respectful and not flaunting knowledge (Cram, 2001, p. 38). The classroom teacher and I treated all students in a fair and respectful manner. The were no issues relating to researching Maori students throughout the unit of work, and as the Maori student was not selected for a post-course interview no ethnicity issues needed to be further considered.

Ethical guidelines exist to protect participants, researchers and involved institutions. Zeni (2009) questions whether traditional ethical guidelines need further development for research conducted by practitioners. Due to the reflective nature and often personal 'insider' dimension of the action researcher, Zeni (2009) explains that unique relationships and responsibilities underlie the action research process. Zeni (2009) argues that the following themes must be applied: responsibility and accountability, action and social justice and caring and respect. These three themes refer to action researchers conducting research in a professional and respectful manner while maintaining a broad focus of applying findings to larger forces in society. By adhering to the University of Canterbury's Ethical principles as well as Zeni's (2009) underlying themes specific to action research I would argue that I conducted my research in a manner which was professional and respectful to all.

Chapter 4: Findings

4.1 Introduction

This investigation examined online module participation and NCEA achievement of sixteen boys studying towards a physical education achievement standard in a blended format. A team teaching approach was used to teach boys in a blended learning format over a six-week period during May and June, 2012. The six-week structure allowed for six mini action research cycles of reflection and evaluation of teaching. Throughout the unit of work data were collected from various sources including field notes; in-class observations; my own notes written during module creation and marking of student work; and data extracted using the report function of the LMS. Participation data was analysed and matched with achievement to understand the relationship between online module participation and NCEA achievement. All names of students used are pseudonyms.

4.2 Outline of the unit of work

The three topics of anatomy, exercise physiology and biomechanics were taught in three two-week sections during the unit of work. The classroom teacher and I set pedagogical aims and student learning objectives which guided weekly online module and face-to-face lesson design. Pedagogical aims applied to our own personal teaching aims while student learning objectives were based on the prescribed content from the evidence/judgements from the Physical Education 1.2 Achievement Standard Exemplar's Achievement Criteria (Appendix 20). Refer to 3.6.4 for an outline of the unit of work. The classroom teacher and I met at the end of each week to reflect on whether the aims and objectives had been achieved. Reflections were based on professional judgement, discussion, student bookwork completion during face-to-face lessons and marking of student contributions to the online module.

Each of the six one week cycles led to minor online module design changes. However, the module evolved into three relatively distinct phases each lasting approximately two weeks. Within the first two weeks an introductory 'settling in' phase was evident, followed by a developmental phase with increased participation, and a final two weeks of a lower quantity but increased quality of participation. Throughout the online module student participation was closely examined. At the conclusion of the unit of work, five students were purposefully selected for post-course individual interviews because they were 'interesting cases' in terms of achievement and online module participation (see table 4.17).

This chapter presents the findings in two parts. Part one examines achievement and online module participation in the unit of work and part two explains the progression of the three phases. The three phases include excerpts from my field notes and observations, LMS data, comments from the classroom teacher (Peter), as well as comments from the five students who were interviewed at

the conclusion of the unit of work.

4.3 Part One: Achievement and participation

4.3.1 NCEA achievement in the unit of work

Table 4.1 shows final grade achievement based on NCEA assessment criteria for all sixteen students in the class. Available grades in order of merit were: 'Not Achieved, Achieved, Merit, Excellence.'

Table 4.1

Student's NCEA achievement at the end of the physical education course (n = 16)

Student's name	NCEA achievement grade
Alex	Achieved
Corbin	Achieved
David	Achieved
Donald	Achieved
George	Achieved
Glen	Excellence
Kerry	Merit
Mike	Excellence
Pat	Achieved
Paul	Achieved
Ryan	Achieved
Simon	Achieved
Steve	Achieved
Tony	Merit
Vinny	Not Achieved
William	Merit

Fifteen out of sixteen students gained a pass grade ('Achieved' or better) for their NCEA achievement. In the post-course interview I specifically asked students whether they thought they would have achieved the same grade had they learned solely face-to-face. All interviewees felt they achieved a higher grade than what they would have, had they been taught solely face-to-face. Two typical responses were:

> *"Worse if I didn't have it, [the online module in Moodle] because it's faster for the marking … and if we didn't know a question, we didn't know what was wrong and you could tell us and we could move on and it had the answers most of the time for us instead of in a class putting our hand up and waiting, asking more people."* (Tony, student interview, June 2012)

> *"Probably not because especially with the quizzes with the long answer quizzes, especially the one at the end just prepared me a lot more because quite often in other classes we learn the stuff but we don't learn what we are going to need to do in the test so that was quite helpful."* (Mike, student interview, June 2012)

In his post-course interview, the classroom teacher also indicated that NCEA achievement for the blended learning class was significantly higher than classes taught solely face-to-face:

> *"Pretty good, and compared with other classes – right up there, like I think we had fifteen out of sixteen, we only had one that didn't achieve and overall that is a good result … and then overall maybe we had an 80% pass rate this year [for all classes] and our class – around 95%. That's pretty high and I think that's a case that the [blended] teaching is working."* (Peter, teacher interview, June 2012)

Teaching in a blended format appeared to be a significant factor for the successful achievement of the students at School A. However individual student motivation was likely to have contributed to higher NCEA achievement. One of the top achieving students, Glen stated in his post-course interview that the main reason for achievement was his own internal motivation:

> *"I think …I mean at the end of the day I really wanted to get a really high mark and …I really had to put my head down and do it all really to get the mark…"* (Glen, student interview, June 2012)

In contrast, another student who did not achieve to the same high level as Glen gave an insight into his motivation when learning:

> *"It just depends what like mood I'm in, but like if I was doing it in class in a good mood then I can learn, and same for here…"* (Tony, student interview, June 2012)

Findings showed high levels of overall achievement for students taught in the blended format unit of work. Determining whether achievement was related to participation in the online module was another question which guided the study and will be reported in the next sections.

4.3.2 Participation in the online module

Participation was measured via amount of activity and quality of activity in specific components of the online module. Amount of activity was measured by: number of discussion forum posts, number of quizzes completed, whether an assignment was uploaded and LMS activity. Quality of activity was measured via grades that I awarded based on students' performance in the following activities: each discussion forum post; each quiz completed, and the assignment (refer to 3.6.8).

4.3.3 Discussion forum participation

Discussion forums were a weekly activity in the online module and topics were based on Physical Education Achievement Standard 1.2 Exemplar Assessment Schedule. Discussion forum topics were focussed on anatomy, physiology or biomechanics. I used relevant sporting athletes to stimulate discussion and also to help to explain technical topics. Figure 4.2 provides an example of a discussion forum starter question from week four.

Figure 4.2. Screenshot from week four discussion forum topic starter question

Discussion forum participation data were gathered for each student. These data were based on: number of discussion forum posts, number of responses to discussion posts and quality of each discussion post. Discussion forum post quality was determined by grading each post out of ten (refer 3.6.8). Marks were determined by me and a mark of ten out of ten was given to students whose forum post was correct, relevant and specific. No students were awarded a zero mark for a forum post and those who recorded lower marks (one–two) answered the question incorrectly or were vague in their post. Figures 4.3 and 4.4 give two examples of participant responses to a discussion forum in week four. This forum asked students to discuss short term exercise responses for an athlete when running a marathon. The example from Figure 4.3 was awarded nine out of ten, while the example from Figure 4.4 was marked five out of ten.

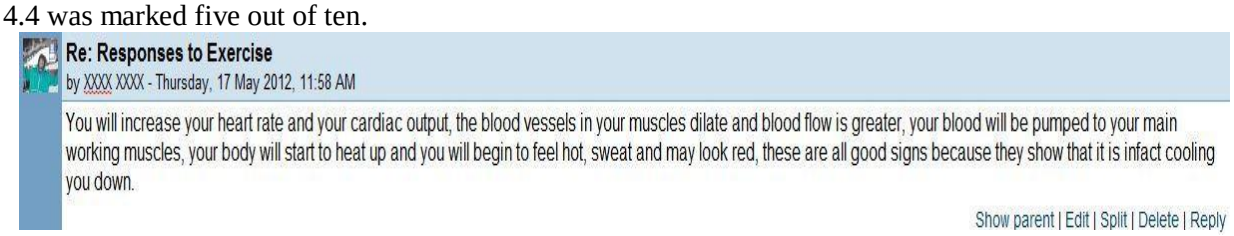


Figure 4.3. Week 4 discussion forum student example awarded a nine out of ten mark

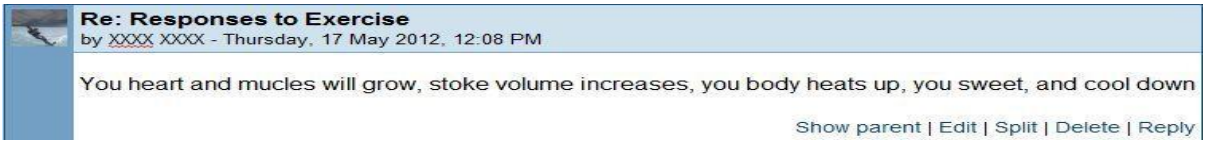


Figure 4.4. Week 4 discussion forum student example awarded a five out of ten mark

Figure 4.5 shows the total number of discussion forum posts and average mark of discussion forum posts matched with NCEA achievement for all of the students involved in the study.

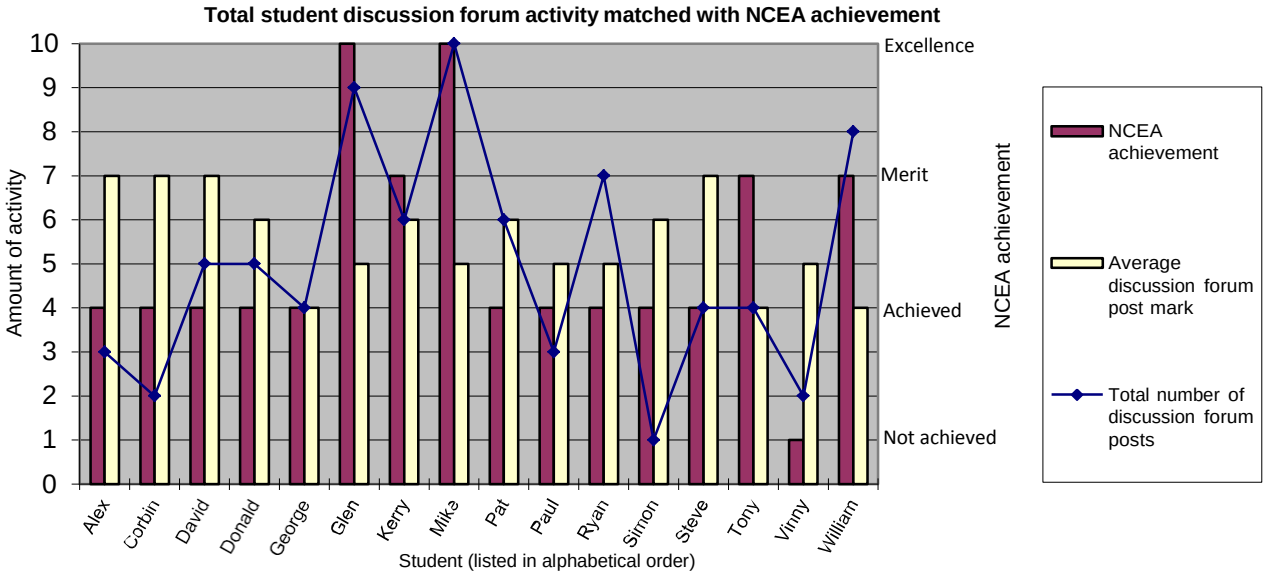


Figure 4.5. Total student discussion forum activity matched with NCEA achievement

Most students posted to two or more of the discussion forums and the average discussion forum post mark was six out of ten. The average number of discussion forum posts for all students over the six-week module was four. Students were given a mark based on their quality of contribution to the discussion forum, and this mark averaged four out of ten. Table 4.6 shows the average number of discussion forum posts and the average mark given to discussion posts matched with NCEA achievement. For example, students who gained an 'Achieved' final grade, on average made 3.7 discussion forum posts at an average mark of six out of ten for each post.

Table 4.6
Average discussion forum activity matched with NCEA achievement

	Not achieved	Achieved	Merit	Excellence
Average number of discussion forum posts	2	3.7	5	7.5
Average mark given to discussion forum post	5	6	4.7	5

Table 4.6 shows a positive trend between average number of discussion forum posts and NCEA achievement. However, no trend appears to exist between the mark given to discussion forum posts and NCEA achievement.

4.3.4 Quiz participation

Weekly quizzes consisted of a mixture of previously taught topics and upcoming material to be assessed. Quizzes combined multi choice, short answer and essay style questions. All multi choice questions were self-marked via the LMS. Short and long answers were checked and graded by me. All questions were based on evidence/judgements from the Physical Education 1.2 Achievement Standard Exemplar's Achievement Criteria (See Appendix 20). As with discussion forums, I used relevant sporting athletes to stimulate responses and to help to explain technical topics. Figure 4.7 provides an example of a quiz section from week four.

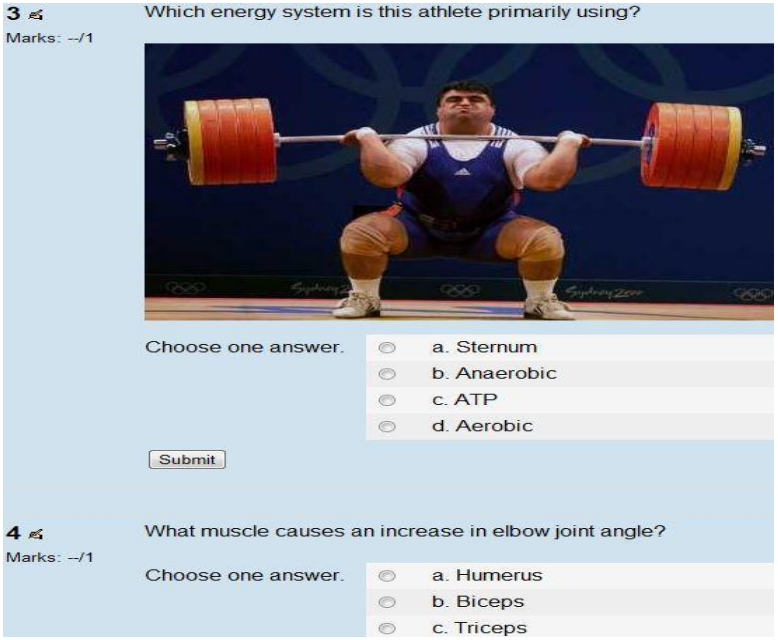


Figure 4.7. Screenshot of week four quiz question example

A record of the number of quizzes completed and the mark for each quiz was collected for each student throughout the online module. Number of quizzes completed was based on a student beginning and submitting a quiz. Quality of quizzes completed was based on a mark out of ten graded by me (refer to 3.6.8 for mark allocation). Figures 4.8 and 4.9 give two participant answers to a quiz in week four. This quiz question asked students to discuss short term exercise responses for an athlete when running a marathon. The quiz answer shown in Figure 4.8 recorded a top grade of ten marks, while the quiz answer shown in Figure 4.9 recorded a five out of ten mark.

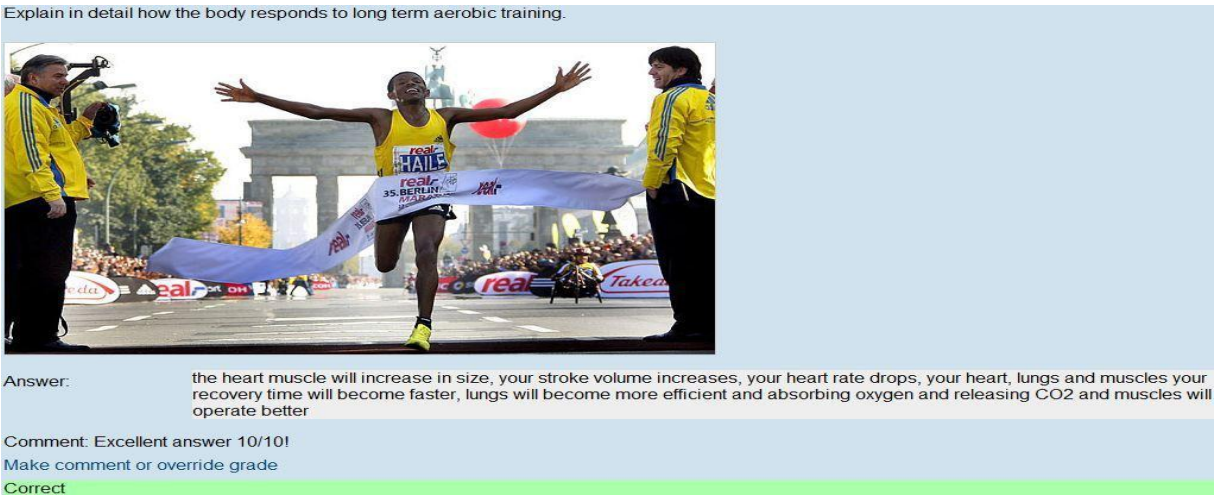


Figure 4.8. Student quiz response example from week four awarded a ten out of ten mark

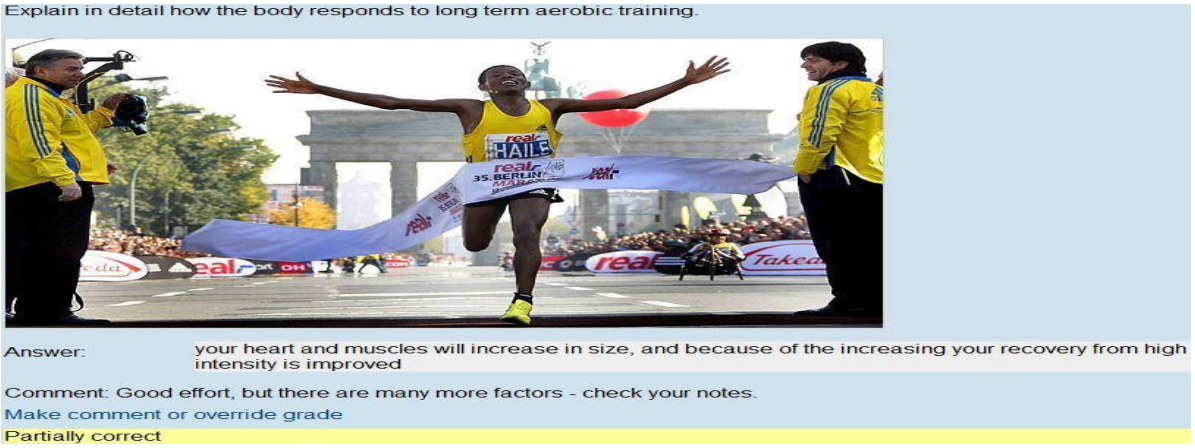


Figure 4.9. Student quiz response example from week four awarded a five out of ten mark

Figure 4.10 shows the number of quizzes completed and the average mark from quizzes completed matched with NCEA achievement for each student. The average number of quizzes completed for all students was 4.5 out of six and the average mark of completed quizzes was seven out of ten. There does not appear to be a link between number of quizzes completed and mark earned.

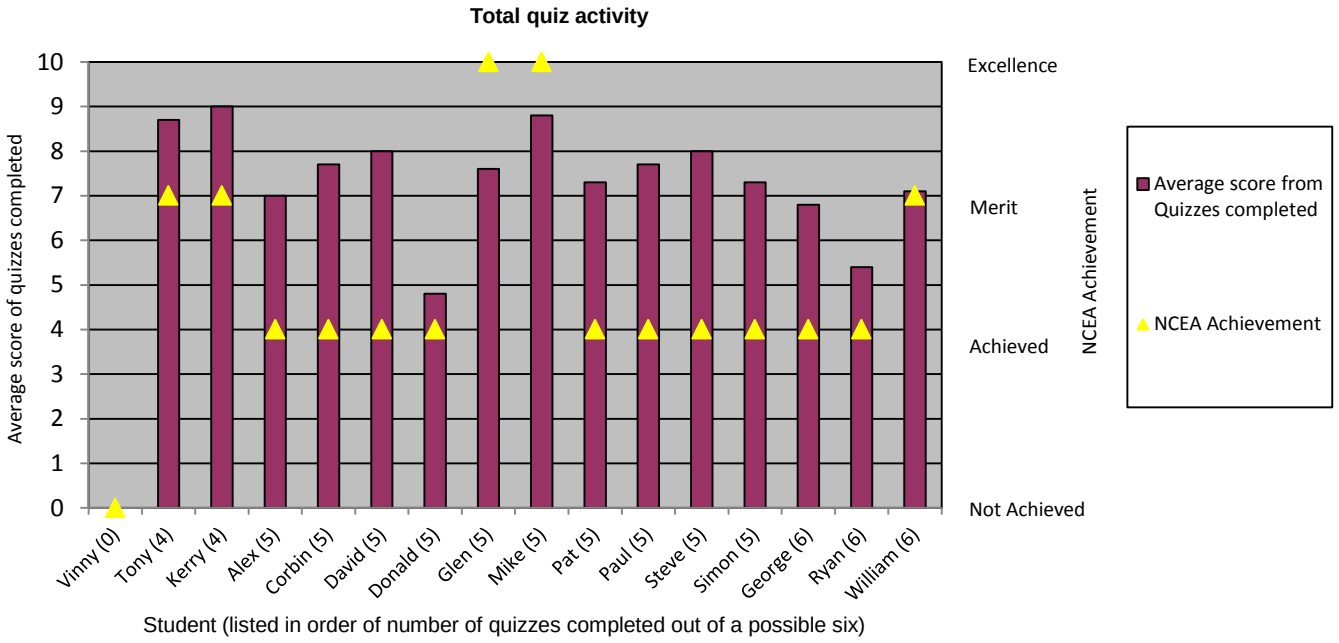


Figure 4.10. Total quiz activity by each individual student matched with NCEA achievement

Table 4.11 shows the number of quizzes completed and the average mark from the quizzes completed compared with NCEA achievement. For example students who recorded an 'Achieved' final grade, on average completed 4.7 quizzes at an average quiz mark of seven out of ten.

Table 4.11
Average quiz activity matched with NCEA grade achievement

	Not achieved	Achieved	Merit	Excellence
Average number of quizzes completed	0	4.7	4.6	5.5
Average mark from quizzes completed	0	7	8.3	8.5

Table 4.11 shows no clear trend between average number of quizzes completed and NCEA achievement. However a trend exists when average mark from quizzes completed is compared with NCEA achievement. On average, students who recorded higher NCEA grades tended to earn higher average marks from quizzes completed.

4.3.5 Assignment participation

An assignment was used to determine whether students could describe and apply Newton's Three Laws to a sporting context. This assignment was posted in week five and involved students completing and uploading a simple PowerPoint presentation explaining Newton's laws of motion. The assignment details are shown in Figure 4.12.

Using Power Point, summarise Newton's Laws of Motion. You need to describe each law and it's application to a sporting context.

Your presentation must contain at least four slides and have pictures to aid your explanations.

Upload your assignment here once completed.

Figure 4.12. Screenshot of week five assignment

Each assignment was marked by me and awarded a mark out of ten (refer to 3.6.8 for grade allocation). Figure 4.13 shows an example of part of an assignment which received a top grade of ten marks.

Third Law - Action - Reaction

The first force applied is the action and the opposing force is the reaction, for every action there is an equal and opposite reaction. There is a better reaction when running on concrete compared to sand.

Figure 4.13. Assignment example from student awarded ten marks out of ten

Student achievement in the assignment was pleasing, all students who completed the assignment scored marks at or above eight out of ten. Figure 4.14 displays class marks for the assignment.

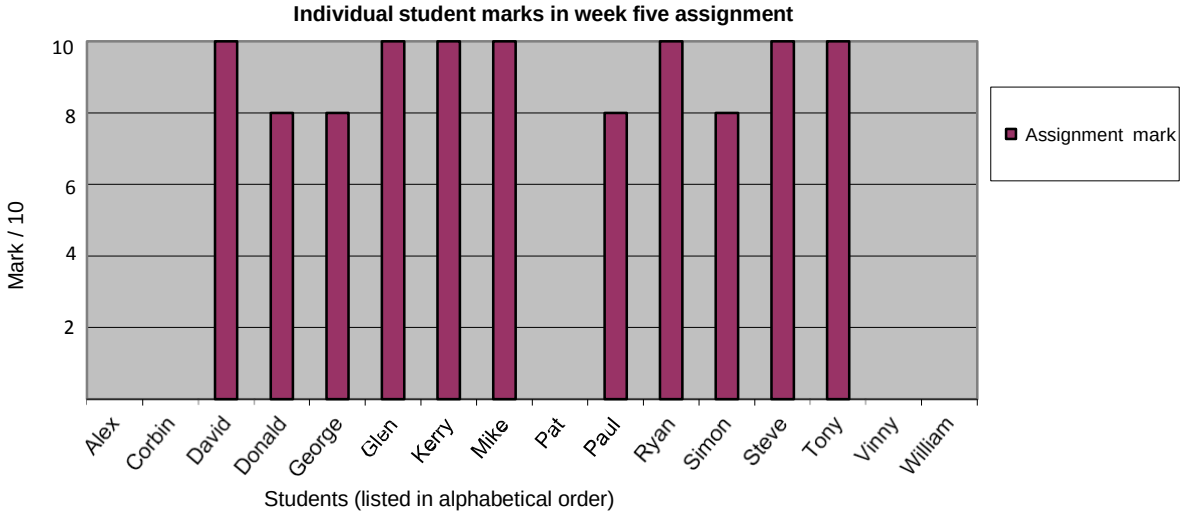


Figure 4.14. Individual student marks in the week five assignment

Seven out of eleven students who uploaded the assignment were given full marks. Those who did not upload the assignment recorded zero marks.

4.3.6 Total participant LMS activity

The report feature of the LMS logged all student activity including number of: page views, additions (for example, additions to forum discussions), updates (for example, changes made to existing additions such as forum posts), deletions (for example deleting a student's own forum post). Total activity for each student is displayed in Figure 4.15.

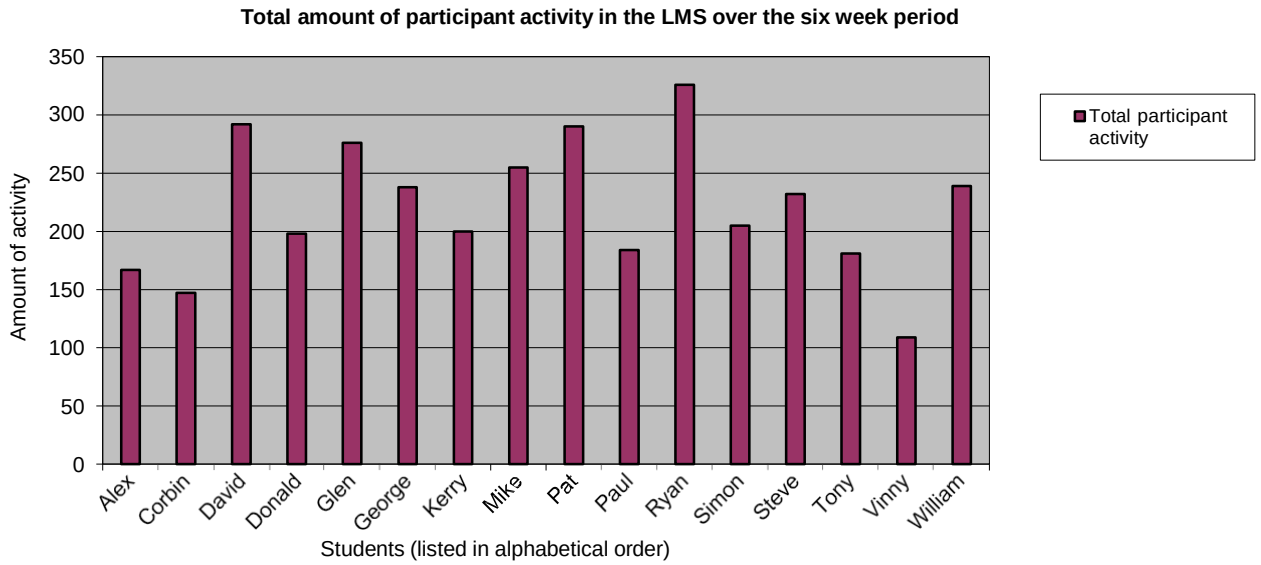


Figure 4.15. Total amount of LMS activity by each individual student over the six-week period

There was considerable variation in student activity over the six-week period of the online module. Total activity ranged from a low of 109 (Vinny) to a high of 326 (Ryan). The average amount of activity was 221 for all of the students in the online module. This is a rather crude measure of online activity and it does not represent productive learning from the module. It does however represent the potential opportunity to engage in learning material from the LMS. Those students who recorded less overall activity probably had less opportunity for participation and achievement.

4.3.7 Matching participation to NCEA achievement

For the purposes of this research, at the end of the online module, each student was allocated an overall participation score. This grade out of ten was based on level of activity and quality of activity during: discussion forums, quizzes, the assignment (refer to 3.6.8 for the rubric for mark allocation) and also total LMS activity. This participation score was matched with NCEA achievement and is displayed in table 4.16. A more detailed description of participation can be found in Appendices 16 to 20.

Table 4.16
Student's overall module participation matched with NCEA achievement (n=16).

	NCEA Achievement grade	Participation score / 10
Alex	Achieved	4
Corbin	Achieved	4
David	Achieved	9
Donald	Achieved	7
George	Achieved	8
Glen	Excellence	9
Kerry	Merit	7
Mike	Excellence	9
Paul	Achieved	4
Pat	Achieved	6
Ryan	Achieved	9
Simon	Achieved	7
Steve	Achieved	8
Tony	Merit	7
Vinny	Not Achieved	1
William	Merit	7

Figure 4.17 shows the trend between NCEA achievement and individual participation score.

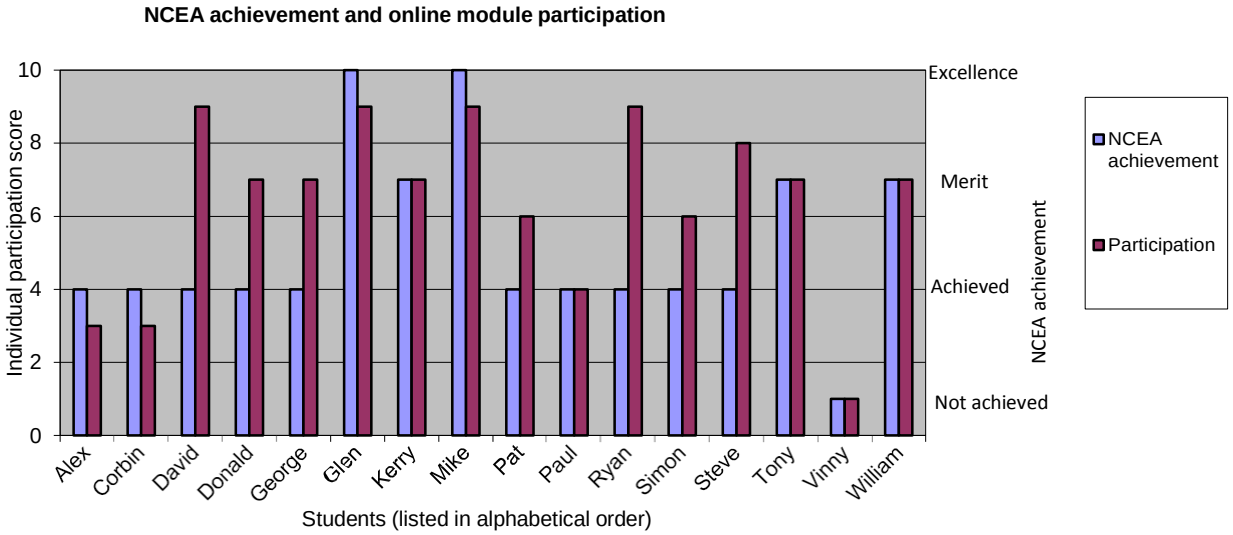


Figure 4.17 NCEA achievement and online module participation for each individual student

Figure 4.17 does not show a consistently positive trend between individual participation score and individual NCEA achievement. However, when grouping students according to NCEA grade awarded, the comparison to total participation average score reveals a positive trend. For example table 4.18 shows students who recorded a 'merit' grade for NCEA achievement had an average participation score of seven out of ten.

Table 4.18
Participation score matched with NCEA achievement

	Not Achieved	Achieved	Merit	Excellence
Participation score	1	6.6	7	9

4.3.8 Student selection for interviews

Five interesting cases of participation and NCEA achievement were selected for post-course interviews. These students were selected to gain a deeper understanding of trends within the online module and also participant thoughts on the effectiveness of learning in a blended format. The five interesting cases chosen are shown in Table 4.19.

Table 4.19

Five students purposefully selected for post-course interviews

	Participation Code	NCEA Achievement
Glen	Very high level of online module participation	Very high achievement
Mike	Very high level of online module participation	Very high achievement
David	Very high level of online module participation	Moderate achievement
Tony	Moderate level of online module participation	High achievement
Vinny	Low level of online module participation	Low achievement

The five students were interviewed within one week of the conclusion of the unit of work. The semi-structured nature of the one-on-one interviews enabled me to ask extra discretionary questions to gain more detailed information, or pursue or clarify a point where necessary. Obtaining rich descriptive qualitative data on participant thoughts was essential to explain trends of participation and achievement. I cite from these interviews with students in the following section.

Part two of this chapter is divided into the three distinct phases represented by the progression of the online module. My field notes reinforce each phase and comments from the five participants feature throughout. Interview responses and comments from the classroom teacher are also cited in this section.

4.4 Part Two: Progression of the online module

4.4 Phase one: Introductory phase

4.4.1 Introduction

Initial preparation of the module involved a considerable time commitment. I wanted to create a learning environment that would captivate and reassure students learning in this new format. Most students developed online confidence quickly and appeared enthusiastic about learning in this manner. There were several technical difficulties that hindered this first phase, some of which were caused by School A's computer system, and once due to instruction ambiguity. The pedagogical aim for the first two weeks was for students to participate in the online learning module and the student learning objective was for students to achieve an in-depth understanding of anatomical principles of the body.

4.4.2 Preparation

I had previously taught this same course in a blended format for the past two years, therefore I was able to use resources and ideas from previous years. Creating this year's online module still took a considerable amount of time. After several hours of inserting pictures, videos and creating forums and quizzes I was confident I had created an engaging and up-todate online module. Teaching any lesson requires preparation time, however upon viewing the first online lesson the classroom teacher noted that developing an online module would take significantly more time than a face-to-face lesson. I recorded in my field notes:

> *"Peter wondered how long it took to prepare the activities for this week's session. He was surprised that each session takes about three hours to make. This is not realistic for a busy teacher, but once set up [some time can be saved as] it can be used from year to year."* (Researcher's Field Notes, lesson 2, April 2012)

I met the students at the beginning of their first face-to-face lesson in term two. At the beginning of the lesson I introduced myself to the students and informed them of my study. Most students appeared interested to learn in a blended format and there were several simple questions about participating in my study. After handing out consent forms and information sheets to all students, Peter began the first face-to-face lesson. I was impressed with the students' enthusiasm for the new topic of human body function – all appeared focussed in class and completed bookwork tasks on basic anatomy with ease. After observing students in the classroom and taking notes on what Peter had covered in this first face-to-face lesson, I noted that I would need to make several changes to the online module. Peter's pace of teaching was much faster than mine would have been, had I been teaching the face-to-face lesson. I added extra information to the online module about the skeletal system and also a timetable so that students had more information about the progression of topics over the next six weeks. Maintaining consistency with Peter and what he taught in the face-to-face lessons was an important aspect of my

role as a team teacher. Although the students had two different teachers for this topic, it was very important for them to still receive consistent messages and content when learning online and face-to-face. Anticipating Peter's teaching speed was an aspect of team teaching which I found difficult early in the module. I recorded in my field notes:

> "*Peter's teaching speed may be quicker than mine – he covered more than I thought he would today. I will need to ensure that I check with him first how much he will cover each lesson, before planning the online lessons."* (Researcher's Field Notes, lesson 1, April 2012)

4.4.3 Building confidence

I arrived early at the computer room for the first online learning lesson to ensure the room was unlocked and set up correctly. Based on my observations, most students appeared to be positive about participating in this new type of learning. They entered the classroom quickly and immediately logged on to their computers. Although they appeared confident, I assumed most were a little apprehensive as the pre-course questionnaire indicated that fifteen out of sixteen students had not learned in a blended or online format before. Due to this inexperience, most students were unfamiliar with the *Moodle* LMS, and early in this first lesson, students had many questions which were primarily about logging in or navigation around the LMS.

In order to increase the likelihood of participation and social presence right from the beginning of the online module, I attempted to create an environment in which students felt confident to participate in this new learning medium. As I had taught several of the students involved in the study before, I was aware of which students were more confident and academically able. In the first lesson I spoke to these boys and asked them to contribute early to the online activities, reassuring them that their contributions were accurate and would be well received by other students. Once these more academically able students posted, others quickly followed. The success of this strategy was confirmed in an end of course interview with Glen.

> *"I think I usually waited until at least two people had done it so I kind of knew what to write and then it kind of added to my knowledge so I knew what to write, so I could write quite a good response to the forum."* (Glen, student interview, June 2012)

In order to maintain a positive learning environment, I did not encourage students to comment on others' posts or activities in the first phase. I could not risk reducing student confidence to participate due to a negative response to a peer's post or action. In order to promote participation, I also attempted to create a sense of community within the class by asking students to introduce themselves online, find a picture to represent them and state what they hoped to achieve in the upcoming assessments. Most boys introduced themselves online and many selected sporting heroes as their profile

picture. I was surprised at the high expectations for achievement in the assessment. Of the eleven students who contributed to this forum, nine predicted that they will score a 'Merit' grade or better from a potential range of: 'Not Achieved, Achieved, Merit, Excellence.'

4.4.4 Technical difficulties

Several technical difficulties were encountered during the first phase of the online module. After 30 minutes of the first online lesson School A's computer server crashed and consequently students could not participate in the second half of the lesson. I found this very frustrating and so too did Peter. After learning from the ICT technicians that a solution was not immediately available, Peter discussed the risks of relying on technology when learning online. I recorded Peter's comments in my field notes:

> *"These are the things that stop teachers from having a go at teaching with technology, you can still teach, if we were in a normal classroom."* (Peter, teacher interview, June 2012)

Another technical difficulty arose early in the first phase when students found the instructions of an activity difficult to follow. Students used WallWisher.com (see Figure 4.20) to describe their thoughts on an anatomical concept. A correct answer required a picture to aid the explanation. Many students completed the typed text answer easily, however only two out of eleven students included a picture.

Figure 4.20. Screenshot of student responses to week one wallwisher.com activity

Several boys expressed their frustration at not being able to paste a picture properly, which in turn frustrated those looking at the page. Most boys copied the picture link from *Google images* and pasted this link in to WallWisher.com. However, in order for the picture to show, the picture link from the original website source needed to be copied and pasted to WallWisher.com. In the second week I gave much more specific instructions about how to correctly insert a picture, but there were still many pictures not showing. I was disappointed as I had used WallWisher.com in the past two online modules and found it to be a very effective tool for learning. In the previous modules, most students could paste picture links correctly. I carefully reviewed my instructions and found that although the instructions were relatively straightforward, the format needed improvement. The format I had created in the LMS involved reading instructions first and clicking on the corresponding link related to the activity below. Figure 4.21 displays a section of the instructional format for weeks one and two.

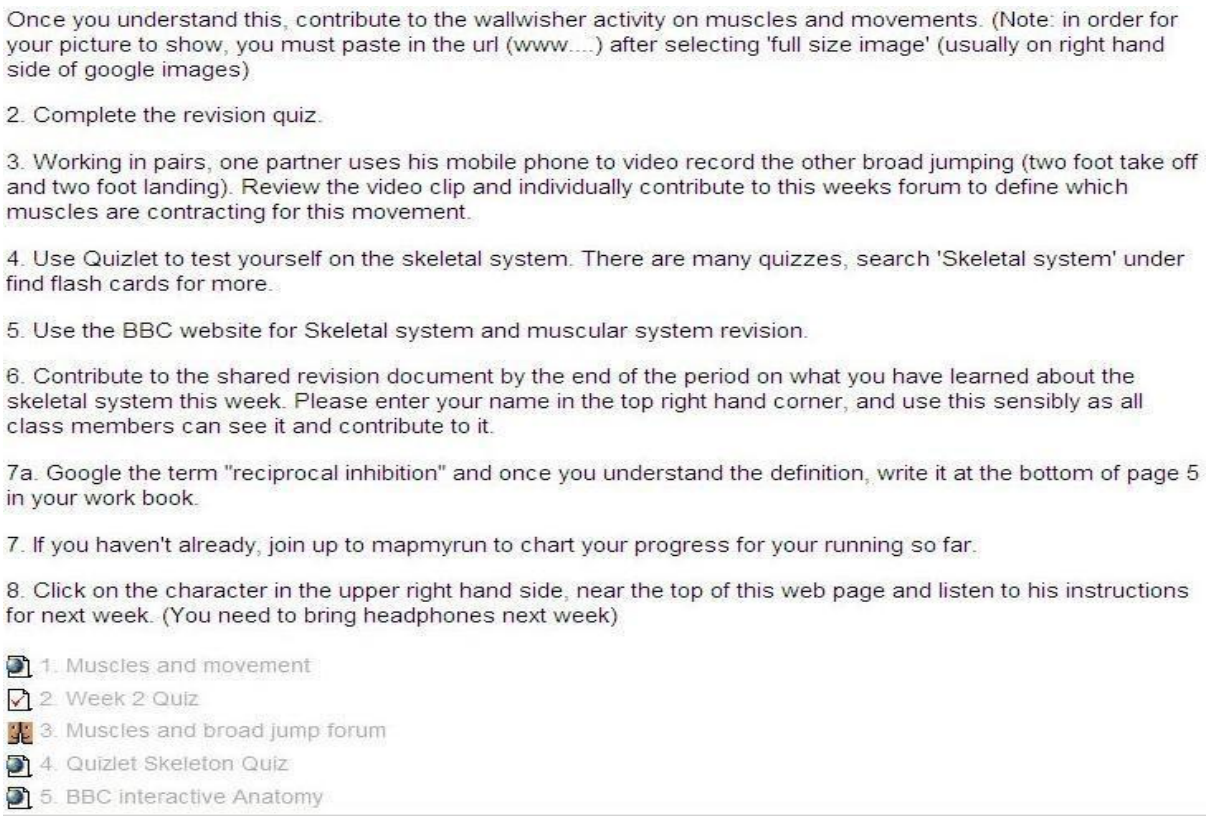


Figure 4.21. Week one online module instructions layout

I recorded in my field notes:

> *"Instructions above, link below format appears to not be ideal for this group of boys. I think boys tended to want to read instructions and then do the activity straight away."* (Researcher's Field Notes, lesson 4, May 2012)

I decided to change the layout to incorporate the activity within the instructions. With this format, students would click on hyperlinks or activities within the instruction sentence. Figure 4.24 displays an example of the instructional format for the remaining weeks of the module:

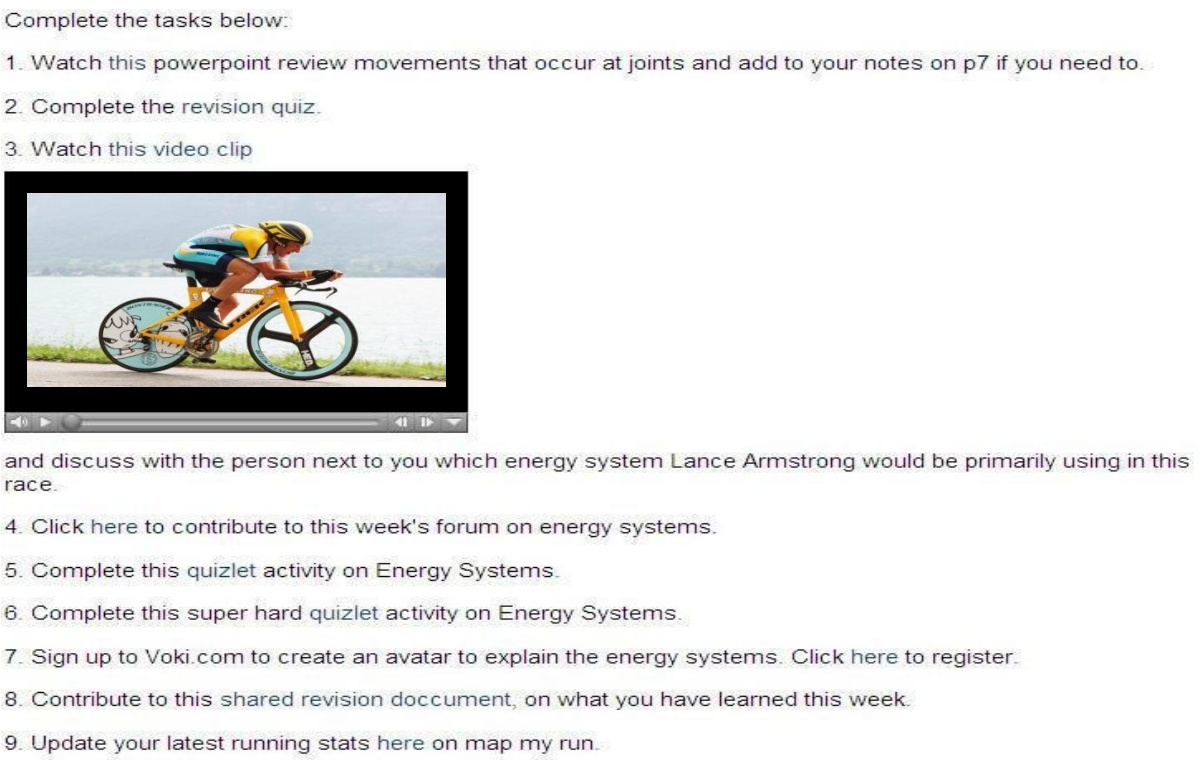


Figure 4.22. Screenshot of online module instructions layout from week two

This instructional format was more effective; in week two I recorded in my field notes:

> *"Boys working much more independently, I'm not needed anywhere as much to help out. Boys are better at using the LMS but I think the new layout and links within the instructions is better."* (Researcher's Field Notes, lesson 6, May 2012)

I decided not to persist with the WallWisher.com activities as by week three there was quite a negative feeling amongst students toward it. Instead I used other teaching tools such as Quizlet.com and the forums within the LMS.

4.4.5 Concluding thoughts after phase one

Upon reflection at the end of the first phase, I was satisfied with overall student progress in the module. Technical difficulties are always a potential challenge when learning with technology and the students and I experienced several in this first phase. Regardless of these difficulties, from my observations the online module appeared to facilitate learning. At the end of the second week I recorded in my field notes:

> "*General feeling from Peter and I was that the course was running well...all boys engaged and learning / revising well."* (Researcher's Field Notes, lesson 6, May 2012)

The pedagogical aim for the first two weeks was for students to participate in the online learning module and the student learning objective was for students to achieve an in-depth understanding of anatomical principles of the body. To measure whether students participated in the online learning module I used activity data from the LMS to view the number of students taking part in the online activities of: forum posts, WallWisher.com posts, and quiz completion. These activities were selected as the LMS clearly recorded student activity for these three tasks. Table 4.23 shows the number of student posts to weekly forums; number of student posts to WallWisher.com and number of students who completed quizzes in phase one. Although relatively superficial measures of participation, this data gave an overall indication of student activity which was invaluable information for planning weekly module activities.

Table 4.23
Summary of student activity during phase one using quantitative measures

	Number of students posting to forums	Number of students posting to WallWisher.com	Number of students who completed
Phase one	10/16 (63%)	11/16 (69%)	14/16 (88%)

In order to measure whether students achieved an in-depth understanding of anatomical principles of the body, I used quiz marks from week's one and two. Based on my experience of teaching this unit of work and student achievement in previous online modules, I determined that students needed to achieve a mark of at least 70% in the quizzes to demonstrate an 'in-depth understanding' of anatomical principles. Data from the weekly LMS quiz results over the two weeks revealed that on average only six out of sixteen students achieved this learning objective.

At the end of the first phase, two students had contributed very little to the online module. Figure 4.24 displays the number of student contributions to all activities at the end of phase one. This chart shows that two students had participated in one or less of the seven online activities required of them.

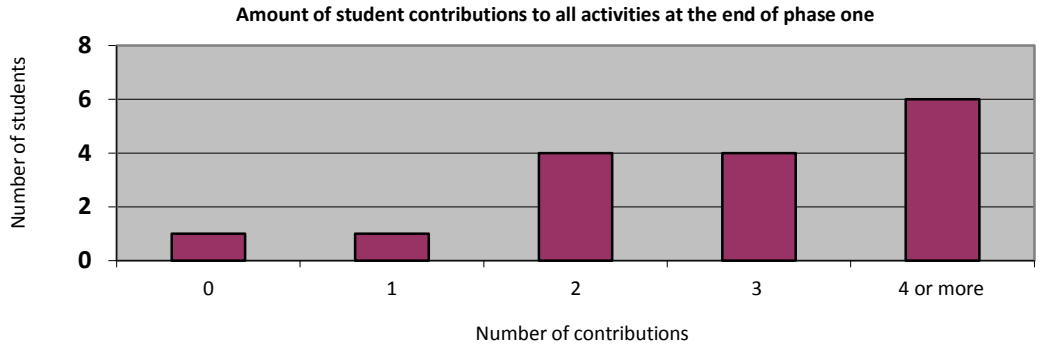


Figure 4.24. Number of students and their contributions to all activities at the end of phase one

After discussion with Peter we decided that the threat of a relatively small punishment would be appropriate for students who didn't participate in the online learning activities as required. Although we were reluctant to punish students for failure to contribute to the LMS, this stance was justified because punishments are usually issued for non-completion of class work or homework at School A. It was decided that students who did not contribute to the weekly activities would receive a homework detention. All members of the class were informed at the beginning of week three about the consequences of not participating.

4.5 Phase two: Settling in phase

4.5.1 Introduction

In phase two students became more familiar with navigation around the online module and LMS data showed increased levels of participation. I observed a high degree of independent learning in the computer room. The crucial role of the online module designer was also evident in this phase as creating a cooperative but at times competitive learning environment was an important aspect of module design. I encountered difficulties adhering to my role as a team teacher and the classroom teacher and I discussed differing levels of student participation when learning online and face-to-face. The pedagogical aim for this second phase was for students to participate in the online module with a greater sense of community and the student learning objective was for students to achieve an in-depth understanding of the physiological principles of exercise.

4.5.2 Participation in the online lessons

In the first online lesson of phase two, students looked enthusiastic as they entered the classroom. All students logged on to their computers immediately — giving the impression they were keen to participate. Boys were engaged in the activities before they were given explicit instructions to begin the lesson. I recorded in my field notes:

> *"Boys came in to lesson and immediately logged on to Moodle. No one looking to do anything else. Boys seem really keen and interested — all boys, not just those academically able or interested."* (Researcher's Field Notes, lesson 8, May 2012)

Although I tried to encourage verbal discussion and peer collaboration as much as possible throughout the online module, I was surprised at how quiet the room was for the two online lessons in this phase. Some of the students in this class have a reputation for rather boisterous behaviour so the classroom teacher and I were impressed with this level of independence. From our experience these students would not usually enter a face-to-face classroom and begin to work without being instructed.

> "*Peter felt that it (the lesson) was mostly successful due to the independent nature of the boys working which seems to take a fair while to create in a face-to-face environment."* (Researcher's Field Notes, lesson 8, May 2012)

I asked the boys directly in their post-course interviews about their participation in the online lessons, particularly their level of independent work. Their responses indicated that they did find the idea of working with technology appealing for a variety of reasons. Mike discussed the novelty of learning online and the immediacy of the online module:

> *"Being on computers made me want to do it a lot more … something different, whereas on a bit of paper, you sort of think when you are there you think 'oh it's just a piece of paper, I can catch that up later' sort of thing but when it's on the computer you've got a list of things and you've got a deadline and you sort of think, okay I can do this now."* (Mike, student interview, June 2012)

Glen, David and Vinny discussed learning styles and their preferences for taking in information:

> *"Yeah I did, because it was better than sitting in class taking notes the whole time it was more interactive learning, where I could do it myself and learn in my own way…"*(Glen, student interview, June 2012)

> *"Yes I did enjoy it more than book work because it gave diagrams and pictures and stuff and I am more of one of those learners that has to see things to learn it so I think it was better than doing it off a book."* (David, student interview, June 2012)

Interestingly, Vinny also alluded to his enjoyment of the independent nature of learning online rather than the lesson being wholly determined by a face-to-face teacher:

> *"... I just liked it better than sitting in the classroom and because we all stuck to our own thing, instead of like just looking at a white board."* (Vinny, student interview, June 2012)

Peter mentioned learning styles in his post-course interview and the value of students being able to learn in different ways:

> *"... the kids they need that different stuff, it's like the whole VARK thing, they need the visual, audio, reader, kinaesthetic learning, the different ways they learn it, the different ways they pick it up…"*(Peter, teacher interview, June 2012)

4.5.3 The online module designer

The importance of the online module designer's role was evident during phase two. Experience, adaptability, availability of time, and knowledge of students were key attributes crucial to the success of the online module. I estimated that it was now taking five hours per week to create activities, respond to forum posts, check contributions and mark quizzes within the online module. This considerable time commitment was recognised by the classroom teacher in his post-course interview:

> *"I think the time factor of ... setting it up looked like it would have been quite a big task I also think reviewing all the information, checking all the forums were right, checking who had done what is another time constraint which would have been really tough."* (Peter, teacher interview, June 2012)

As the course progressed I became more efficient at maintaining the online module, but as student confidence increased, a new role for the online teacher developed which added to the time requirement. The ability to read student forum posts and guide learning required a constant overview of all student posts. Timely feedback or comments from me were critical for students to gain an accurate overall picture in forum debates or questions. An example of this was evident in an energy systems forum from week four (Figure 4.25). After several student posts on a complex topic, I carefully edited a student contribution to guide all readers toward the type of answer needed for the upcoming exam:

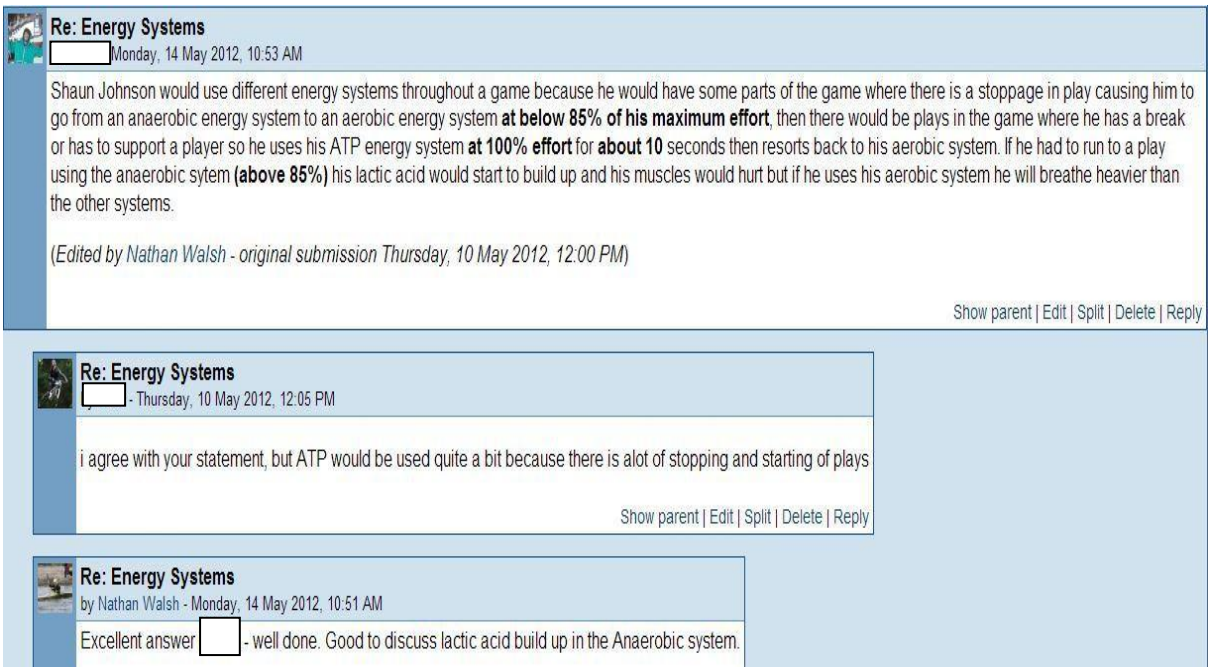


Figure 4.25. Week four forum example of student and teacher discussion forum posts

Marking quizzes accounted for the majority of time spent maintaining the online module. Although features of the quiz creator within the LMS allowed for self-marking, longer answer questions were unable to be self-marked. Marking and grading students' quiz answers took approximately two hours every week. This amount of time was probably much less than what it could have been, as sixteen students was an unusually small class size for Year Eleven Physical Education at School A.

Creating an appropriate tone throughout the module was also an important role of the online module designer. Practice enabled me to ensure a positive and respectful environment where students were encouraged to participate. Giving straightforward instructions while writing in a friendly manner was also important and I recorded this in my field notes after two weeks of the online module:

> *"Have included a feedback/welcome at the beginning of the week/topic notes to link from week to week, trying to stay positive about participation, congratulating boys for contributing and achieving. Important to mark tests every week and provide a comment in the start of each week of whom is doing well etc. This will hopefully promote more positive contribution/activity etc."* (Researcher's Field Notes, May 2012)

Due to previous experience teaching in a blended format, I had a good understanding of activities which were effective for learning in an online module. Equally important, was my knowledge of the students being taught. I used my experience of boys' education to promote interest and participation in the online module. All material used in the online module was developed specifically for the

module and the group of learners. I developed tasks and activities which I knew would appeal to the students in this class. Relevant sporting heroes were often used as examples to help reinforce theoretical concepts. For example in week five's forum the actions of a well-known rugby player (see Figure 4.26) were used as an example to help explain the application of Newton's three laws.

Explain in detail how any one of Newton's three Laws affect Dan Carter in a game of rugby. To gain excellence here, you need to explain using Biomechanical terms from your book as well as names of muscles and movements the muscles cause. You may like to paste a picture to aid your answer.

Figure 4.26. Week five energy systems forum topic

Based on my experience of teaching boys, competition is an excellent motivator for effort and achievement. As part of my goal to develop a learning environment with a sense of community, I wanted to create a slightly competitive environment by identifying particular students who had been participating well in the online module. I identified about seven boys each week who had been achieving high grades in the revision quizzes or contributing well to forums. Identifying and praising these students formed the basis of my 'welcome' to the new week. From my observations, boys enjoyed reading this introduction and being identified for excellent work. This was reinforced in the post-course interviews:

> *"Because when other people were doing it I'd want to do it. If they were on task I'd be on task, not slacking and stuff and I'd see other people… like you did that write up at the start of each week and I got … well in something like a quiz or something, then I would do that again as long as I was on task I'd stay on task."* (Tony, student interview, June 2012)

> "*… because I sort of competed to get the best in the quizzes and stuff like that and put in good responses and stuff so it just made more people to compete with which made you work a bit harder."* (Mike, student interview, June 2012)

Other students also spoke about the importance of competing when learning:

> *"..., if you like check your emails and it came up that somebody else posted before you, you thought, well I'm like behind now, so I have to catch up you'd do a few more extra hours at home and it's a bit more extra time at home to catch up."* (David, student interview, June 2012)

> *"I guess if you are looking over someone else's shoulder and see they're ahead of you it makes you put your head down and want to work harder to keep up with them so you don't..."*
> *Interviewer: "Is it the same in a normal classroom?"*
> *"Yeah I guess, you know if you see someone ahead of you then you usually want to keep up to the same standard it's always good having that someone who is better than you in each class then you aim higher."* (Glen, student interview, June 2012)

An online module designer must adapt to the needs of students. Reflection at the end of each week allowed for reshaping of weekly lessons to enhance participation or create more user friendly activities. However, it is not so easy for an online module designer to adapt or change a lesson in progress. All activities must be prepared before the first student logs on and often set activities are unable to be altered. This issue arose several times throughout the online module. For example in week four students were asked to create an animation using www.Go!Animate.com to help explain the body's energy systems. The students were initially engaged with this activity, however technical issues made it impossible to view the completed animations. I recorded in my field notes:

> *"Go!Animate seemed to be working well. Boys enjoyed making animations. (Later) Boys can't seem to play back and watch animations they have created in Go!Animate. No student could watch any video they had created. I tried to recover by asking boys to submit their videos to me in their own time – but don't expect they will. Will not use Go!Animate again in class."* (Researcher's Field Notes, lesson 8, May 2012)

When activities did not work as planned, Peter asked students to continue with the next activity. On one occasion technical difficulties meant students finished all of the online activities early. To use time productively, Peter attempted to teach face-to-face in the computer room. Due to the shape and layout of the room attempting to teach face-to-face was very difficult and quite ineffective.

The teacher's role when teaching an online lesson is quite different to his role when teaching face-to-face. When teaching face-to-face the teacher has the ability to modify activities based on 'reading' the students in the class. Being able to see students' faces in the face-to-face classroom is a key tool to

enable learning. For example a face-to-face teacher conducting a class discussion can alter its length or probe student thinking based on a range of student feedbacks and listening cues such as eye contact, body position and head movement. An online module designer is unable to use this teaching tool.

The role of the online module designer was crucial for the creation, grading and maintenance of the online module. From my in class observations of the online lessons, students appeared to be working very independently and most boys were engaged with the learning activities. In the post-course interview I asked the boys whether the physical presence of a teacher in the online lessons was necessary:

> *"... we wouldn't have done as well – it would have been possible to do it, but it is easier with the teacher because you know what you are doing and if somebody tells you what you have to do and I just think it would take a bit longer if you had to do it at home by yourself without any previous people's knowledge."* (David, student interview, June 2012)

Interestingly Vinny described that the presence of a teacher in the online learning lessons was important but a teacher with specific subject knowledge may not necessarily be needed:

> *"There's just a thing with teachers – you just do your work when they are around."* (Vinny, student interview, June 2012)

Glen expanded on this point by stating that perhaps the content knowledge is not necessarily needed, just some technical knowledge:

> *"Well my computer knowledge isn't that great, so ... if I knew how to use a computer really good then no [I wouldn't need a content expert teacher]."* (Glen, student interview, June 2012)

4.5.4 Sense of community

My pedagogical aim for weeks three and four was for students to participate in an online learning module which has a greater sense of community. In order to create a sense of community I asked all students to make two contributions to the weekly discussion forums — one which had their own thoughts and ideas and another which responded to someone else's post. Ideally I wanted to promote deeper discussion, where boys would construct knowledge from working together. Although falling short of critical debate, I was impressed with how the boys responded to this new expectation. Boys were contributing valuable ideas and feedback. From reading through the forum it was evident

students were learning not just from their own posts but from others too. Figure 4.27 displays a forum on human body energy systems from week four which shows a good example of students reading each other's work before contributing their own thoughts.

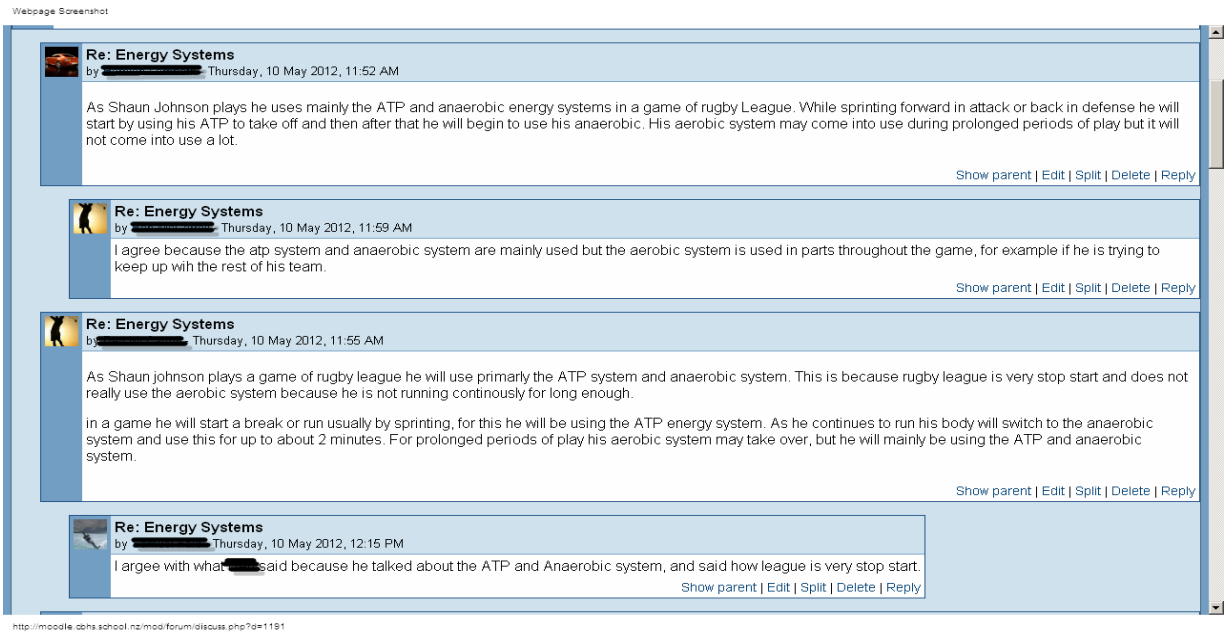


Figure 4.27. Week four student contributions to discussion forum on human body energy systems

All five students interviewed at the end of the course felt that the forums were particularly useful for their learning. All three students recognised the value of constructing knowledge via learning from others:

> *"Yeah, it was good as well as for showing your knowledge it showed what other people knew and you could learn off the other people in your class. So it was quite helpful."* (Mike, student interview, June 2012)

> *"Yes, because it kind of showed me what other people had written and it kind of gave more ideas and expanded my knowledge of the topic so it was a good idea."* (Glen, student interview, June 2012)

> *"... you could write down what you thought was true and then if it wasn't true or it was wrong someone else could correct you, they could say – 'oh no that's not right, it is this..."* (Mike, student interview, June 2012)

4.5.5 Team teaching

My first priority as the online module designer was to ensure the online module was operating effectively. When designing the module I was well aware of my role as a team teacher and I needed to ensure that I was teaching consistent material to Peter. As the unit of work progressed, I found my

role as a team teacher becoming more complex. By attending all of Peter's face-to-face lessons, I ensured that the online content I taught was consistent with his teaching. However our different pedagogical styles meant students experienced two different methods of teaching (face-to-face and online) as well as two different styles of teaching. My pedagogical style — regardless of the teaching format — involves promoting an environment where students construct their own learning and learn from their peers as much as they do from me. Peter's teaching style during face-to-face lessons was much more direct and teacher centred than mine. I was surprised at this pedagogical approach as I had previously understood that discussion and student contribution was an important part of Peter's teaching style. I asked Peter directly whether he had changed his teaching style because we were teaching in a blended format:

> *"Not really, if I had of done it without the online course I would have still taught my direct lesson, it would have meant that my second lesson in the week would have used it as a revision and I would have done a lot more peer work, where the kids would have done paired up and created quizzes for each other and just revised the previous lesson, so I would have done it in a similar format, but I think the fact that they had the use of the technology gave them a bit more ways to learn. "* (Peter, teacher interview, June 2012)

Peter's comments revealed that he regarded this teaching style ideally suited for the blended format:

> *"…when they (the students) were getting taught in the classroom it was really direct teaching … because they were being teacher fed, rather than a lot of interaction because on the computer it was very independent, they could try different quizzes and different forums and they just got different ways of picking up the information rather than the teacher telling them every time."* (Peter, teacher interview, June 2012)

The timing of the lessons meant that the face-to-face lesson was taught before the online lesson. Based on this format, students' tended to receive new information in the face-to-face lesson and the online lessons were mostly used to reinforce what was covered in the face-to-face lesson. Although this approach was not intended from the outset, it appeared to be effective as Peter as he explained in his post-course interview:

> *"I loved it, I mean it took a bit of the pressure off me as well as the teacher because I knew that each week I was responsible for getting the information across, but then I also had a backup with the online learning and to give them the revision and to go over what was done the previous lesson…"* (Peter, teacher interview, June 2012)

Although the format proved successful I wondered how the blended teaching format would have operated had the lessons been taught in the opposite order, or whether more 'new learning' would

have been more effective in the online lessons. In the post-course interview I asked Peter specifically whether he felt the course would have been as successful if content was taught in a different format:

> *"It probably would have worked but I think the way we had it structured this year was the best, reason being, that going online and doing a lot of quizzes and forums gave them the chance to revise rather than trying to teach it initially through the computer – or through the technology — and them trying to revise in a direct teaching manner, I don't think that would have worked as well whereas the way they could use the computers to interact in maybe a less stressful environment gave them the chance to revise better."* (Peter, teacher interview, June 2012)

An aspect of the team teacher role I found challenging was not having any input to the face-to-face lessons. Although Peter and I discussed what content would be covered in each face-to-face lesson, there was not usually any link to the online content during face-to-face lessons. Creating greater links between the online and face-to-face lessons probably may have encouraged online module participation, and would also have acted to remind those who needed to contribute more to the online lessons. The importance of teaching both aspects of the unit of work, or at least being very familiar with the online and face-to-face content and pedagogy, was highlighted by the classroom teacher in the post-course interview:

> *"... definitely when I was in the classroom teaching it was a direct teaching session, but in the online I think we were both helping out but it was more your course as you had set it up. I knew bits of it, but didn't know everything, when they had questions I could try and answer them, but didn't always know the answers because I hadn't actually set up the online course."* (Peter, teacher interview, June 2012)

Occasionally the classroom teacher was unable to assist with the technical aspects of using *Moodle.* In these instances I could usually help to find a solution. Despite a lack of experience using *Moodle,* the classroom teacher was exceptionally supportive, quickly attending to any content specific questions and always encouraging students.

Creating and maintaining an online teaching module involves a significant amount of set up and maintenance which may not always be achievable for a busy teacher. This study was unusual as the online module designer had no other teaching responsibilities during the investigation. I asked Peter whether he felt that he would be able to teach in a blended format on his own:

> *"I would have found that very difficult, I think the time factor of setting it up looked like it would have been quite a big task. I also think reviewing all the information, checking all*

> *the forums were right, checking who had done what is another time constraint which would have been really tough as a teacher. I know that we are pretty busy and there is not a lot of free time so finding the time to do that would have been the hardest thing. Apart from that it would have been fine – if it was set up and ready to go you could run it but then finding that extra time to review it, find out who has done it, who's done it well and what would have been a time constraint on a teacher."* (Peter, teacher interview, June 2012)

4.5.6 Participation in a blended learning environment

This study gave me the opportunity to observe and reflect on student participation in two contrasting settings. Peter felt the class was participating to "about the same" level online as what they would have with the same course content in the face-to-face setting. From simple observations in the face-to-face lessons, it appeared that the students were participating well — all were facing the teacher, not talking and completing tasks when asked. However, I wondered about this level of participation and whether it was somewhat passive in nature. Unless completed work and understanding is regularly checked, it is very difficult for a face-to-face teacher to determine whether a student is participating by simply being present, or participating and learning. In the online setting regular submissions and checks of participation are expected in which students gain instant feedback, and a recorded trail of activity is available to the teacher. These features of online learning may be a motivating factor for more engaged student participation. I recorded in my field notes:

> *"Students may be present in (the face-to-face) class but it doesn't necessarily mean they are learning. The same can be said for online learning, however at least there is a trail of activity of what the student is doing… unless the teacher specifically checks each student for the whole period it is very difficult for the teacher to see what (if anything?) is being done in the regular classroom."* (Researcher's Field Notes, lesson 8, May 2012)

Three students reinforced their desire for learning via an online module and student David noted in his post-course interview that he was more actively involved when learning online:

> *"Yeah it would suit me I reckon, like I said I am one of those learners who needs to see it, I can't just like listen and read from books, but it's more the hands-on thing that kids enjoy, more people when they are hands-on get more stuff done, instead of like sitting around listening to a teacher and stuff and everyone can be doing it like by themselves and you don't need to wait for a teacher, there's always something to do on there."* (David, student interview, June 2012)

> *"Probably participated a lot more in the online stuff than I did in the writing in class, because the writing in class was just another period in the day, where online course you*

were sort of thinking I've got that next … so I tried a bit harder." (Mike, student interview, June 2012)

" I was probably more focussed on this (online learning) because you could see what we were doing every week and it was easier for you to keep track of what we were doing so… it was a bit better online as well because it's not writing with a pen in every other class so I liked this online better than in the classroom." (David, student interview, June 2012)

4.5.7 Concluding thoughts at the end of phase two

The pedagogical aim for this second phase was for students to participate in the online module with a greater sense of community and the student learning objective was for students to achieve an in-depth understanding of the physiological principles of exercise. I measured participation in the online learning module which has a greater sense of community via: number of forum posts, number of forum post responses and number of quizzes completed. I measured whether students participated with a sense of community via their number of responses to fellow students' forum posts. Although rather superficial measures of participation and sense of community, these statistics were useful to give an overview of fortnightly student activity. The number of quizzes completed and number of forum posts were very similar to that of the first phase. Table 4.28 shows the number of students who completed and responded to posts and completed quizzes for phase two.

Table 4.28

Amount of student participation during phase two

	Average number of students posting to forums / number of students in the class	Average number of students responding to forum posts / number of students in the class	Average number of quizzes completed number of students in the class
Phase 2	12/16 (75%)	7/16 (44%)	15/16 (94%)

I again used a 70% or better average quiz mark over the two weeks as my determinant of whether students could demonstrate an in-depth understanding of physiological principles of exercise. Based on data from the LMS quiz results, twelve out of sixteen students achieved an in-depth understanding of physiological principles of exercise.

At the end of this phase, I was satisfied with the overall level of student participation in the online module and the level of enthusiasm shown by students was pleasing. Peter believed the online

learning component of the course was mostly successful due to the nature of boys working independently. He believed the online module linked well to the face-to-face lessons. There was no need to impose any punishments for unexplained lack of participation at the end of this phase. Simply reminding students of their requirements for the online module seemed to be enough to stimulate them to become more involved.

4.6 Phase three: Variations in participation

4.6.1 Introduction

By the third phase my confidence as an online module designer and teacher was developing and I gained a much greater understanding of what the boys could accomplish each week. The end of course exam was approaching and I wanted more students to use the online module outside of class time. In this final phase students focussed on specific activities within the online module for revision and exam preparation. Based on my experience of teaching at School A and teaching in a blended format, I decided that the pedagogical aim for phase three was to have at least eight of the students' active in the LMS in their own time. The student learning objective was for students to achieve an in-depth understanding of biomechanics.

4.6.2 Encouraging participation outside of class time

All students were expected to be present in class for all of the six scheduled online lessons. Based on my teaching experience at School A, I felt physical attendance in the classes scheduled to work online was surprisingly poor. Figure 4.29 displays the number of student absences from the online lessons, scheduled as one class per week for six weeks.

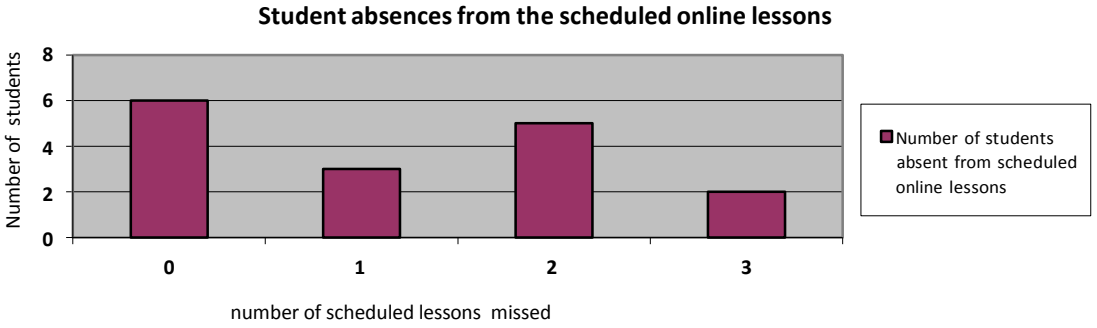


Figure 4.29. Student absences from the online lessons over the six-week module

Seven out of sixteen students missed two or more scheduled online lessons. Although all student absences from lessons were explained by parents (illness, family holidays and school based extra-curricular activities), several boys were using their lack of attendance to the scheduled online lessons as an excuse for not completing online activities. By not completing the online activities students were missing valuable information essential for the exam. I wanted to test whether the frequently identified benefit of flexibility of learning via an online module would be beneficial for the students in this study. I also wanted to encourage participation outside of scheduled class time and to avoid the

disadvantages of absence. During the first lesson in week five, Peter informed students that absence from online lessons was not an excuse for non-participation in the online module. He expected all tasks to be completed within seven days, regardless of whether students were present in class or not. When preparing the online activities for this phase, I created more detailed weekly tasks, expecting that if students did not complete these tasks in class time they would complete them in their own time. Week five's activities consisted of more long answer quiz questions, two forums instead of one and creation of an assignment to be uploaded to the LMS.

During this phase I again observed students enthusiastically entering the classroom for the online lesson. As in previous weeks all boys immediately logged on to their computers and began to read through the week's activities. Most students began the weekly revision quiz first. All boys appeared to be engaged with the activities and on task for the majority of the lesson. Peter and I were again impressed with the degree of independent work. As I expected, the quiz appeared to take most students much of the 50 minute period. I planned that students would note the remaining tasks and complete them in their own time. Peter reminded them of this requirement at the end of the lesson. LMS data for weeks five and six showed overall activity outside of class time did increase, and activity within class time decreased (see Figure 4.30).

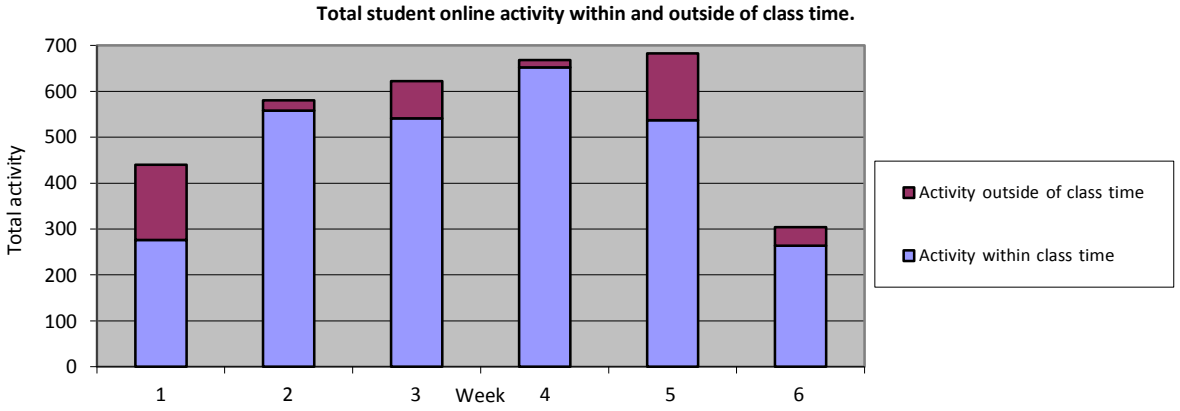


Figure 4.30. Total student online activity within and outside of class time over the six-week module

The decrease in activity within class time was probably due to the need for students to spend more time completing the quiz. Due to the increased quiz length, students were required to spend more time thinking and typing within the quiz activity, which showed in the LMS data as less overall activity. This increase in quiz length was planned and from my observations students looked quite 'drained' by the end of the lesson, leaving the room much less positive than in previous weeks. I recorded in my field notes:

> *"Boys appeared to get a little 'bogged down' at the end of the period. It seemed obvious that they had had enough of learning. Was a fairly full period with the quiz requiring lots of thought and long answers ... This is the trade-off between preparation for the exam and students getting overwhelmed. In hindsight boys probably did well to focus for the 50 minutes they did."* (Researcher's Field Notes, lesson 10, May 2012)

At the end of this phase, data from the LMS showed a significant reduction in amount of activity — one forum in week six having no contributions from students. Although activity outside of class time increased, the number of students online outside of class time was rather small. LMS data showed only six students were active outside of class time in week five, and only four students active for week six. Several important revision activities remained incomplete. Despite Peter's request to complete all weekly activities, two students who were absent from school for the final two weeks of the course did not actively participate in the online module for the time they were away from school. In the post-course interviews, students were asked about online activity outside classroom lesson time and responses were included:

> "*Just didn't really get around to it at home."* (Tony, student interview, June 2012)

> "*Yeah, when I was catching up I did, and for revision and study I went on it and looked at those diagrams and the revision quizzes where you had to put the two together and looked at the forums and stuff like that to see people's answers and see their wording."* (David, student interview, June 2012)

> "*A couple of times I tried getting on to it, but I had some difficulties... It was all coming up as ones and zeros."* (Vinny, student interview, June 2012)

4.6.3 Revision quizzes

As the exam approached, the revision quizzes became an invaluable tool for learning. Fifteen out of sixteen students' completed the week five revision quizzes. I was pleased to see most students

working in pairs, discussing their thoughts before submitting their answers. I was also impressed with the quality and quantity of the answers written – students seemed very keen to contribute good answers to the quiz. I noted in my field notes:

> *"Boys keen on quiz, working in pairs to do it, good to see boys up and doing practical movements and discussing them before their individual submissions. Some very good answers being written for the quiz, good size and looking like good quality."* (Researcher's Field Notes, lesson 12, May 2012)

Figure 4.31 shows an example of a student response to the last week's revision quiz about exercise responses:

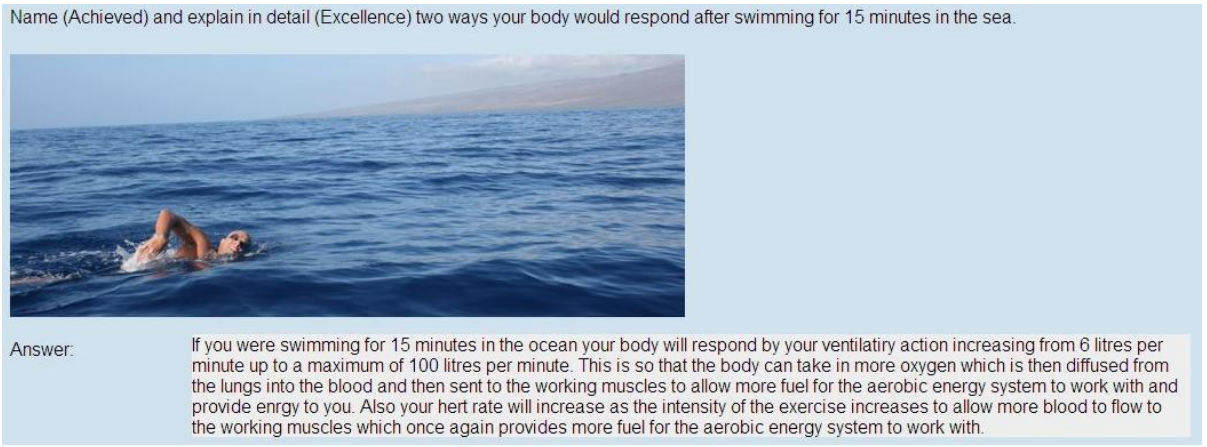


Figure 4.31. Week six revision quiz student response

Student's tended to place a high priority on completing the revision quizzes. From my observations, the quizzes were usually the first activity most students completed at the beginning of each online lesson. They enjoyed the task, many mentioned the value of receiving instant feedback and also they realised how important these quizzes were for the upcoming exam.

> *"Probably the quizzes, the revision quizzes, they were real good. Because they helped revise things from last week and from what we learned the day before."* (Vinny, student interview, June 2012)

> *"The fact that we'd do it … instead of in a classroom it would take like a while for the teacher to go around everyone's work, … and the grade you'd get it without even having to mark it – it's all done on the computer."* (Tony, student interview, June 2012)

4.6.4 Revising for the exam

As mentioned above, the quizzes were useful for revising what had been covered throughout the course; however using the online module for revision proved helpful for the students when preparing for the exam:

> *"Yeah … the revision stuff was so much better on the computer, might not have been as good as if I had been just doing it in the booklet [paper booklet used in face-to-face lessons]."* (Mike, student interview, June 2012)

David discussed the ability to view peer discussion forum posts, comments and quiz answers as useful strategy for revision:

> *"Yeah … for revision it probably helped more than going back to look in a book because on this you can go and look at everyone's answers where if you were doing it in a book you can only just see your answers. You've got nothing to compare it to."* (David, student interview, June 2012)

4.6.5 Concluding thoughts at the end of phase three

The pedagogical aim for phase three was to have at least eight of the students' active in the LMS in their own time. Based on the LMS data, on average only five out of sixteen students participated in their own time during phase three. The student learning objective was for students to achieve an in- depth understanding of biomechanics. In order to gain an 'in-depth understanding' of the principles of biomechanics, students needed to achieve at least 70% in the two weekly quizzes. Based on data from the LMS quiz results, on average over the two weeks, nine out of sixteen students achieved this learning objective.

4.7 Participation in individual online activities

Student activity varied considerably over the duration of the online module. Figure 4.32 shows the percentage of students who completed specific online activities over the six-week period.

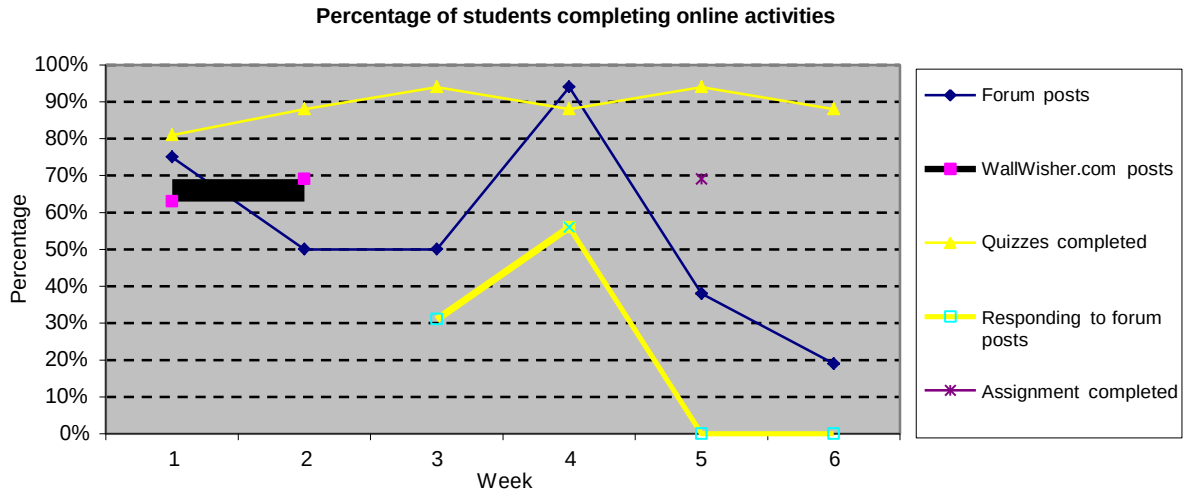


Figure 4.32. Percentage of students completing each individual online activity over the six-week period

The percentage of students who completed the quizzes remained consistently high — on average 89% of students completed quizzes over the six weeks. The weekly average number of discussion forum posts was 54% over the six weeks. The number of forum posts increased dramatically in week four to 94%. This increased number of posts was consistent with a teaching focus of encouraging students to respond to other posts in weeks three and four, thus increasing the overall number of participant posts. A significant reduction in discussion forum posts was evident in the final two weeks. This was probably due to a lack of time to complete forum activities because of an increase in quiz length and difficulty.

Chapter 5: Discussion

5.1 Introduction

This action research investigation examined online module participation and NCEA achievement of sixteen boys studying towards a physical education achievement standard in a blended format. Participation data was analysed and matched with achievement to understand the relationship between online module participation and NCEA achievement. Two questions guided the study:

1. Can learning in a blended format raise boys' achievement?
2. What relationship exists between online participation and NCEA achievement?

This chapter will examine the achievement of students who were taught in a blended format and compare their achievement with students taught the same content solely face-to-face. High levels of student participation were recorded in specific online module activities such as discussion forums and quizzes. Several factors influenced student participation including individual the role of the teacher, technical issues and student characteristics. Analysis of these factors and an examination of the relationship between online participation and NCEA achievement will conclude the chapter.

5.2 NCEA achievement

The underlying aim of this investigation was to attempt to raise the achievement of the boys in School A in relation to assessment of NCEA Physical Education Achievement Standard 1.2. Historically, lower student achievement has been evident for this theory based physical education achievement standard than for any of the other more practically oriented physical education achievement standards. Teaching in a blended format was a strategy used as an attempt to enhance achievement. Students taught in a blended format recorded higher NCEA achievement than students taught the same content solely face-to-face. Fifteen out of sixteen (94%) students taught in a blended format gained a pass grade ('Achieved' or better). This result was higher than the 77% pass grade average from similar classes where students were taught solely face-to-face without the benefit of the online resources and activities. Higher achievement of students taught in a blended format confirmed Chandra and Lloyd's (2008) findings. Conducting a similar study with similar aged students, Chandra and Lloyd reported that students learning in a blended format achieved higher final test scores than students taught solely face-to-face. Interestingly, Chandra and Lloyd noted that the most significant levels of improvement were seen with lower-achieving boys. In the present study, students taught in a blended format gained a range of pass grades: 'achieved, 'merit' and 'excellence', indicating that the blended learning format raised NCEA achievement, and was a suitable learning format for lower- achieving and higher-achieving boys.

In terms of this study there is evidence to support the argument that learning in a blended format may have been responsible for raising NCEA achievement. Although the possibility exists that the students learning in a blended format were more academically able than the classes taught solely face-to-face, the blended learning class was not a streamed class and student ability is likely to be similar to other classes and previous years. In post-course interviews all students believed they would not have achieved as highly if they had been taught solely face-to-face. Students alluded to several reasons for their achievement and participation including: readiness to learn and engage with technology, specific activities within the online module, the role of the classroom teacher, and specific activities within the online module. These points will be described more fully in the sections below.

5.3 Student readiness to learn with technology

Learning via an online module can be challenging for adolescent students. Previous research has shown that despite modern secondary school students having a high degree of digital literacy and social skill, there is a reluctance to transfer this skill and enthusiasm to an educational setting (Bolstad & Lin, 2009; Parkes et al., 2011; Wright, 2010). From the pre-course questionnaire (Appendix 12) 11 of the 16 students were unsure about learning online and lack of computer skill was most frequently identified factor which would affect their participation. These initial responses suggesting apprehension to learn online were not evident throughout any part of the study. From my observations, interview responses and discussions with the classroom teacher, all students appeared to be enthusiastic and ready to learn via the online module. This enthusiasm was observed in class, and during post-course interviews several students explained their preference for learning via an online module rather than in face-to-face lessons. Based on my experience at School A and knowledge of boys' education, I expected students' involved in the study would show enthusiasm for learning with technology. Findings from the present study were similar to Gunn, et al., (2003) who reported males were not apprehensive about using online material and were confident in their overall technical ability when learning online. The high level of confidence also observed in the present study was demonstrated through students' eagerness to participate. This readiness to learn with technology potentially contributed to high levels of NCEA achievement.

Students clearly articulated their preference for learning via the online module. In post-course interviews students were able to describe how the online lessons appealed to them and how the lessons met their learning needs. The design of the online module was based on knowledge and experience of teaching boys. Research indicates that boys learn best with visual learning using colour, diagrams and pictures (Irwin, 2009; Keller, 2011) and audio visual techniques (Brown et al., 2001). These approaches were particularly relevant in this study. Care was taken to include strong visual features such as video clips and images in order to link physical education theory to practice. Students found the visual component of the online module particularly appealing and this was noted by students during post-course interviews. For example, student David explained how he liked being able

to see pictures and diagrams as opposed to reading and writing. The classroom teacher also mentioned that boys need different opportunities to learn information, not just via the traditional methods of reading, writing and listening.

Student enthusiasm and readiness to learn with technology fostered a high degree of independent learning during the online lessons. From observations and discussions with the classroom teacher, students' independent learning skills were much more apparent in the online lessons than the face-to-face lessons. At the beginning of face-to-face lessons, most students would sit and wait for the teacher to arrive before opening their books to ready themselves for learning. This was in stark contrast to the online lessons where students' would log in to the online module and independently begin the weekly activities before the teacher arrived in the room. The classroom teacher was pleased with the unexpected level of independent student work via the online module. Similarly, increased student independence when working in an online module as part of a blended learning environment has been reported by Pratt and Trewern (2011) and Ng (2008).

5.4 Discussion forums

The process of discussion is a critical dimension of learning and the discussion forum is an integral component of a successful online course (Davies & Graff, 2005; Hiltz, Coppola, Rotter, Toroff, & Benbunan-Fich, 2000; Lewis, 2002). I was unsure how students in the present study would use online discussion forums. Previous tertiary education level studies of gender and online interaction have shown the use of discussion forums by males has been rather low (McSporran & Young, 2001; Yen & Lee, 2011). In the present study, discussion forum usage statistics were pleasing as ten out of sixteen students contributed to half or more of the available discussion forums. From viewing all student posts to discussion forums, it was evident students would read other students' posts to expand their knowledge before submitting their own post. In contrast, a few students four were reluctant to make postings, possibly due to fear of appearing ignorant or to lack of motivation, as reported by one student. Almost all weekly discussion forums contained contributions from a range of students and no student dominated any one discussion forum. From post-course interviews, students stated they enjoyed the ability to create knowledge via the social constructivist nature of the discussion forum. Most students valued the ability to view and comment on peer posts to develop their own knowledge. This study confirms views that interaction and dialogue are essential for productive learning (Cohen, 1994; Qin, Johnson, & Johnson, 1995; Roschelle, 1992).

Students who contributed more frequently to discussion forums recorded higher NCEA achievement than those who contributed less frequently. All discussion forum posts were given a mark out of ten based on quality of the discussion forum post. No relationship appeared to exist between discussion forum post marks and NCEA achievement; however; a relationship did exist between discussion forum post frequency and NCEA achievement. These findings were unexpected as all discussion

topics were based on likely exam questions and I predicted that students who contributed good quality posts would be able to transfer this knowledge to the final exam. However, frequency of post appeared more significant and has been noted by others. For example Wang and Newlin, (2002) and Wang, Newlin and Tucker, (2001) found that the total amount of activity in chat and discussion forums was a likely indicator of overall achievement, rather than the content of what was contributed. This finding indicated that developing student confidence and encouraging simple participation in an online module appears to be important for student achievement.

Research indicates that encouraging students to participate early in an online module appears beneficial as students who have a high participation level in the first week of an online course will achieve a higher result (Coldwell, Craig, Paterson, & Mustard, 2012; Wang & Newlin, 2002). In order to encourage early participation in the online module of the present study, a series of strategies was used. Most of the strategies were endorsed by online course designers and included the following: discussion areas should start with a social ice breaker for students to introduce themselves (York, Yang, & Dark, 2007); employ structured activities with clear tasks (Hughes, di Corpo, & Hewson, 2006); and the online teacher should always use a positive and friendly tone (Elbaum et al., 2002). Upon analysis of findings from the present study, there did not appear to be a consistent link between the amount of participation in the first week of the online module and NCEA achievement. Student participation in the first week of the online module was generally low and in some cases the high achieving students recorded the lowest amount of participation. Most students' participation was recorded solely in the prescribed lesson time, where activities such as adding to forums or quizzes were most frequent. This indicated students completed the necessary tasks in class time and further participation may have been viewed as unnecessary.

From face-to-face lesson observations and LMS discussion forum data, many more students were actively participating in online discussion forums than in face-to-face discussions. The teacher centred approach used in face-to-face lessons resulted in few opportunities for students to participate in face- to-face discussions. By contrast, all students appeared comfortable participating in online discussion forums. All students in the class contributed to at least one online discussion forum over the six-week period, and most students contributed excellent ideas and opinions. Similarly, Dantas and Kemm (2008) found students would participate more often in online discussions than face-to-face discussions, perceiving the online environment as less threatening. Students have less difficulty communicating online if they can interact both online and face-to-face with their teacher and classmates (Dantas & Kemm, 2008; O Dwyer, Carey, & Kleiman, 2007; Parkes et al., 2011). Student confidence to participate in online discussions was probably due to the timing of the unit of work. As the unit of work began after five months of face-to-face teaching, the students already knew each

other reasonably well and each student had developed enough social presence and confidence to contribute confidently online. Interactions in online environments are often influenced by social factors such as students' relationships with their teacher and classmates (Bolstad & Lin, 2009). Zaka (2012) notes that with blended learning, relationships are often developed during face-to-face interactions, indicating that when students have the chance to physically interact with one another they can become more confident to communicate and collaborate online.

5.5 Quizzes

Choosing engaging activities beneficial for learning was a key strategy when creating the online module. Although literature based on the importance of online quizzes for overall achievement is inconclusive, Dobson (2008) and Itoh and Hannon (2002) believe online quizzes are a valuable tool to help students learn and to focus their study efforts. In post-course interviews, all students identified weekly quizzes as an activity which was particularly useful for learning. LMS data confirmed weekly quizzes were viewed and completed by nearly all students. The high number of students who completed quizzes and the overall high marks they achieved was pleasing. This was interpreted as students' being aware of the value of completing quizzes and being prepared to put time and effort into finishing the quizzes to a high standard.

In the present study, a strong relationship appeared to exist between individual mean online quiz mark and NCEA achievement. These findings were not surprising, as weekly quiz questions were based on the type of questions which were likely to arise in the exam. Previous researchers have also concluded online quizzes enhanced summative exam performance for students learning in a blended format. Online quiz performances were also a valid predictor of exam performance (Dobson, 2008; Ellis & Calvo, 2004; Itoh & Hannon, 2002). Itoh and Hannan in particular noted that students valued completing online quizzes as they reduced student anxiety and gave students an opportunity to practice under test conditions. In the present study, the number of quizzes completed was not related to NCEA achievement. For example, student Alex completed two out of six quizzes at an average mark of seven out of ten and recorded an 'achieved' NCEA grade. Student George completed six out of six quizzes at an average mark of seven out of ten and also recorded an 'achieved' grade. These findings were unexpected. Completion of the quizzes required students to think critically and create essay type answers which I anticipated would enable students to stay up-to-date with course content and hence perform well in the exam. Johnson (2006) also discovered similar findings for students preparing for an undergraduate psychology exam. Despite a low number of students completing the optional online quizzes, the quality of quizzes completed was a good indicator of overall performance.

Quizzes were also a valued tool for the classroom teacher. LMS data from quizzes provided valuable feedback where quiz marks were used as evidence by the classroom teacher to chart student progress and indicate possible exam performance. When marking online quizzes, feedback and advice was given where possible on how to improve achievement. If students' quiz marks were lower than expected, the classroom teacher would approach the student to encourage participation and achievement. Dantas and Kemm (2008) also recommend the use of quizzes because teachers can identify and help students who are most likely to perform poorly in summative exams.

In this study quizzes were used to encourage students to revise, read ahead and think critically about the course material. Students usually completed the quiz before the other module activities and most students recognised quizzes as a good opportunity to practice an assessment closely related to what was likely to be encountered in the exam. As all quizzes were graded and commented upon, quizzes provided students with valuable feedback. The teacher's feedback has been identified as the single most important factor affecting student achievement (Hattie & Timperley, 2007).

5.6 The teacher

Teaching the unit of work in a blended format involved a team teaching approach. The classroom teacher taught all face-to-face and online lessons, however his role was primarily as a facilitator for the online lessons. The online lesson material was prepared by the online module designer, who was also a teacher. Clear communication was essential between the classroom teacher and the online module designer, but differing philosophies on pedagogy meant a team teaching approach was challenging at times.

Differing pedagogical approaches resulted in different learning opportunities for students. The classroom teacher predominantly used teacher centred pedagogy during face-to-face lessons, while the online module designer used student centred pedagogy throughout online lessons. Interestingly, the classroom teacher believed a teacher centred approach was ideally suited to face-to-face lessons when teaching in a blended format. Lai and Pratt (2009) discovered similar findings with secondary school teachers using technology for learning. Teachers using video conferencing would employ a teacher centred approach in an attempt to deliver as much content as possible during video conferencing lessons. Only with time and experience did teachers use a more student centred approach and take advantage of other modes of learning to teach students outside of this video conferencing time. In the present study the student centred approach of the online module was well received by students and several commented that they valued the opportunity to learn from each other. A student centred approach is a recommended practice for New Zealand teachers regardless of teaching context or mode. The New Zealand Curriculum describes facilitating shared learning as one of seven strategies recommended for effective pedagogy. "As they engage in reflective discourse with others, students build the language that they need to take their learning further" (Ministry of Education, 2007, p.

34).

Differing views on the value of the online lessons was a challenging aspect of team teaching in a blended format. The classroom teacher viewed the online lessons as a 'back-up' and a 'separate course' to the face-to-face lessons. In his perception, the main content was taught in the face-to-face lessons and reinforced via the online module. Alexander (in Hedburg, 2006), also discovered a lower perceived importance of online lessons by face-to-face teachers. The overwhelming impression of teachers and students at five Australian Universities was that online lessons were little more than the provision of information. Often this information was perceived as background and organizational for the course, rather than the provision of key ideas directly relevant to the topics of the course (Hedberg, 2006).

The classroom teacher's perceptions of the value of the online module may have been due to having little input into the online lesson material. Although a team teaching approach was used for this study, essentially the online and face-to-face lessons were taught separately. The classroom teacher taught face-to-face lessons with little input from the online module designer and the online lesson material was planned and implemented solely by the online module designer. In hindsight, a stronger blend may have been achieved if the classroom teacher had more input to the online module design and vice versa. Snart (2010) is critical of blended learning courses where the teacher has had little input to the online material. A more collaborative teaching approach in the present study would have likely enhanced student learning experience. At School A the opportunity exists for the classroom teacher to teach the face-to-face lessons and the online lessons. If the classroom teacher had planned and implemented the online lessons, it is likely they would see more value in the online module, as it would have been created using the classroom teacher's own interests and ideas.

The time needed to plan and teach an online module places extra demands on a classroom teacher when teaching in a blended format. This pressure did not exist in the present study as the online module designer was able to prepare and teach the online module without the demands of usual classroom teaching. However, the time commitment required to set up and teach the online module was noted and discussed between the classroom teacher and online module designer. Previous research has also highlighted similar findings, where teaching fully online courses demands a greater time commitment than teaching face-to-face courses (Berge, 1998; Cavanaugh, 2005; Singleton & Session, 2011). According to Tinker (2001), the first time a fully online course is taught, it is common for teachers to spend 40%–50% more time than their colleagues who teach equivalent courses face-to-face. Different faculties have attempted to compensate or reduce time pressures placed on teaching staff time. Some researchers recommend professional development for teachers (Burd & Buchanan, 2004; Queiroz & Mustaro, 2003); teacher release time (Owston, Wideman, Murphy, & Lupshenyuk, 2008); financial and non-financial motivation (Moscinska & Rutkowski, 2011) and Florida Virtual

School offers pre created courses and services to educational institutions which teachers can use with their classes. The present study points to the need for adequate resourcing at School A so that time can be allocated to teaching staff to plan and implement online modules to be taught in a blended format. Professional development or some form of compensation may also be necessary in order to alleviate the extra time needed for teachers who teach in a blended format, particularly in the initial stages of course creation.

The ability of the classroom teacher to provide support and guidance to students during the online lessons was crucial for the success of the unit of work. Previous research has questioned the suitability of blended learning for boys. McSporran and Young (2001) noted males studying in their first year of tertiary education tended to achieve lower grades in an online setting than in face-to-face settings and males and younger students needed the discipline and structure of the classroom to achieve well. In the present study the role of the teacher was a key reason for student achievement and for learning structure being maintained. Students were fully supervised in all face-to-face and online lessons and had many opportunities to ask questions or receive support when needed. The classroom teacher was readily available to answer questions and was very supportive and encouraging to students in both settings. The presence of a teacher has been identified as an important aspect of successful blended learning (Callaghan & Bower, 2012; Oblender, 2002; Parkes et al., 2011; Shaikh & Khoja, 2011). Numerous studies have reported that students, particularly those of secondary school age, need onsite support and face-to-face interaction for effective learning (Chandra & Fisher, 2009; Parkes et al., 2011). In particular Yen and Lee (2011) found teachers play an important part in helping male students to develop self-control and self-motivation when learning in an online module.

Students valued the presence of the classroom teacher during the online lessons. In this setting the classroom teacher took on a facilitator's role, primarily encouraging students and assisting with content specific questions. Interestingly, most students commented that a content expert teacher was unnecessary during the online lessons, suggesting a facilitator with basic ICT knowledge may have been sufficient for learning. These comments were surprising as the classroom teacher was often observed answering content specific questions during the online lessons. This finding needs to be treated with caution, as my teaching knowledge and experience would suggest most boys of this age would value the opportunity to ask for guidance and support from a content expert facilitator. Research on the need for a content expert facilitator for blended learning is mixed. de la Varre, Keane and Irvin (2011), investigating the facilitator's role for rural American high school students when learning via online lessons at school, found a facilitator with content knowledge was advantageous to students' learning. Conversely Hannum, et al., (2008), researching online distance education at American secondary schools, believe on-site facilitators of online lessons do not have to be teachers or even familiar with course content. Hannum, et al., (2008) argue the facilitator's role is not to convey course content, but to help students with their self-management, motivation, and any other general

problems that students may encounter.

Although inexperienced at teaching in a blended format, the classroom teacher's positive relationship with students and readiness to assist students while learning via online lessons was an important feature of the unit of work. Hannum, Irvin, Lei, and Farmer (2008) found on site facilitators' pedagogy positively influenced students' grades. When facilitators were given professional development in the principles of learner-centred instruction, student achievement and course completion rates were improved. The role of the on-site facilitator in online lessons is often underestimated and not always performed by teachers (Davis & Niederhauser, 2006). When students are learning via online lessons, the on-site facilitator's role is to provide social and emotional support (de la Varre et al., 2011); instructional support (Davis & Niederhauser, 2006); to act as a mentor and friend (Harms, Niederhauser, Davis, Roblyer, & Gilbert, 2006), and to promote participation and engagement (Davis & Niederhauser, 2007).

Preparation of the online material was an important aspect of the team teaching process. The online module designer's role was to create material which was relevant, appealing and well suited to an online medium. This was crucial to the success of the unit of work. Teaching experience, knowledge of boys' education and previous post graduate study on best practice in online and blended learning helped to inform the design of the online module. Teachers faced with designing online learning in the absence of prior experience are faced with a particularly complex task (Nicol et al., 2003). Zaka (2012) found it important for the teacher of a blended learning course to be adequately trained to effectively encourage and familiarize students with online dialogue.

5.7 Flexibility

While students were encouraged to use the online module outside of the scheduled classes, student activity was less than expected. Encouraging online module participation outside of prescribed class time was to ensure all students completed weekly activities. It was expected that high online module participation would lead to high achievement. Based on ten years' of experience as a classroom teacher, I predicted students would use the online module to learn and revise in their own time, particularly as the exam approached. I expected the opportunity to study outside the classroom would be particularly appealing to boys and learning via the online module would be an attractive alternative to completing traditional reading and writing homework. Due to the popularity of social media, many students of this age are frequently online which strengthened my expectation of online module participation outside of class lesson time. Despite observing a great deal of enthusiasm to engage with the online module material during class time, this enthusiasm did not translate to high online module activity outside of class time. Reasons for low online module activity outside of timetabled hours

ranged from a lack of enthusiasm or need to technical difficulties. Findings from the present study contrasted with previous researchers' conclusions which have noted that students find the flexibility of blended or online learning particularly appealing (Appana, 2008; Chandra & Fisher, 2009; Davison, 2005; Dziuban et al., 2004). Upon further investigation, most research identifying flexibility as a benefit has been conducted at the tertiary education level. At this level, learners are often more mature and flexibility is often highly valued due to learners having other commitments such as work and family (Graham, 2006).

Research specifically investigating secondary school aged students learning outside of prescribed class time indicates that student participation is often very low at this time (Heinze & Procter, 2004; Parkes et al., 2011). Without supervision or verbal and visual cues, some students may feel socially isolated and some students may procrastinate (Kerka, 1996; Rovai, Ponton, Wighting, & Baker, 2007). Others believe secondary school aged students need to be strongly encouraged to participate when learning in a blended format (Cavanaugh, Gillan, Kromrey, Hess, & Blomeyer, 2004). "There is a role for facilitators/teachers of online learning in creating that motivation extrinsically" (Nicholas & Ng, 2009, p. 323). Elbaum, McIntyre, and Smith (2002) suggest students should sign a learning support agreement outlining expected participation in the online part of the course before the course begins. Assigning a portion of the assessment for class participation is a common practice in online learning courses (Anderson, 2004). Expecting student participation in an online module outside of class time is consistent with School A's policy of completing homework. In all face-to-face lessons, subject work is expected to be completed outside of class time and if it is not, punishments are usually instigated.

5.8 Technical difficulties

During certain times of the online module, infrastructural technical difficulties beyond the control of the students inhibited learning and engagement. These difficulties ranged from an inability to access specific websites to slow internet speeds and even disconnection from School A's computer server. As noted by Wentling, Park and Pieper (2007) these difficulties frustrate learners and have a negative effect on satisfaction with the instructional experience. The classroom teacher was disappointed when technical difficulties arose, and he identified these difficulties as a significant barrier to teaching with technology. Boss (2008) also notes one of the most commonly identified reasons for a lack of willingness to use technology for teaching is due to a lack of technical support. Infrastructural technical difficulties reduced the effectiveness of the online module for students and the classroom teacher.

5.9 Student ability

As an experienced teacher at School A conducting action research, I was well aware of which students were likely to achieve highly and those who were not, irrespective of teaching strategies. The two students who recorded an 'excellence' grade (Mike and Glen) for their NCEA achievement were among the students who were predicted to achieve to a high level. Equally, the student who recorded a 'not achieved' final grade was predicted to be unlikely to achieve highly in the final assessment. Predictions were based on previous knowledge of the students' academic achievement and ability at School A. Leading educational researcher John Hattie believes the most important factor in student achievement is the student themselves (Hattie, 2003). Student ability is more important than type of school, teacher or peers. Kuncel, et al., (2001) also revealed that prior academic achievement was a powerful predictor of future achievement.

The two students who achieved the highest NCEA grades in the present study may have achieved at a high level irrespective of the format in which they were taught. Mike and Glen both mentioned in their post-course interviews that their own internal motivation was a key driver in their success. Research regarding students who achieve highly while learning in a blended format is very limited. Cheung and Kan (2002) researching student characteristics of successful fully online learners at the Open University of Hong Kong discovered that a positive correlation existed between relevant academic experience and students' performance in online courses. Students who achieve highly in online courses are often students who are independent learners with good time management skills and are highly motivated by intrinsic sources (Barbour & Reeves, 2009). Often cited characteristics of successful online students include: interest in the material taught, self-motivation, independent and self-directed learner, critical thinker, family support, positive and timely feedback, accepts responsibility for own learning, organized, and practical knowledge in the use of computers (Irizarry, 2002). From my knowledge of Mike and Glen's time at School A and their interview comments, they both possess many of Irizarry's characteristics. Both students spoke about their self-directed learning and strong interest in the material taught. Their self-motivation skills and critical thinking were observed in online lessons and evident throughout their contributions to discussion forums and quizzes.

5.10 Relationship between online participation and NCEA achievement

Students who participated at higher levels in of fully online courses recorded higher overall achievement (Coldwell et al., 2012; Morris et al., 2005). It was anticipated that students with greater levels of participation in the online module of the present study would also achieve higher overall grades than those students who participated to a lesser extent. However, this expectation was not consistently met across all activities. Some individual aspects of online activity did not show a relationship with NCEA achievement. For example, no relationship existed between number of online

quizzes completed and NCEA achievement. Nevertheless, when all online module activities are considered for participation (number of quizzes completed, marks given to quizzes, number of discussion forum posts, marks given to forum posts, completion of an assignment, mark given for assignment and total LMS activity [view, add, update, delete]) the relationship between participation and NCEA achievement is positive. These findings are consistent with previous research which has shown level of online participation is a good indicator of overall achievement.

Chapter 6: Conclusions and recommendations

6.1 Summary

This thesis presents a detailed investigation of blended learning within a physical education class at a boy's secondary school in New Zealand. An action research approach was used to investigate current teaching practice and improve student achievement. The two main aims of the investigation were to determine whether learning in a blended format could improve achievement and whether online module participation was related to NCEA achievement. A unit of work from Year 11 NCEA Physical Education Achievement Standard 1.2 was taught to sixteen boys at School A in a blended format. While physical education is predominantly a physically oriented subject, Achievement Standard 1.2 (*Demonstrate understanding of the function of the body as it relates to the performance of physical activity)* is a theoretically based achievement standard. Historically, student achievement at School A has been lower for this achievement standard than any of the other more practically oriented physical education achievement standards.

The unit of work was taught in a face-to-face and online format over a six-week period. Online module lessons were taught using the *Moodle* LMS with a variety of activities such as discussion forums, quizzes, images and video clips. Post-course interviews with five students and the classroom teacher provided rich qualitative description of the participation and achievement of the sixteen 15–16 year old boys involved in the study. This qualitative data was triangulated with online participation data from the LMS and NCEA achievement grades.

The results from this investigation suggest that learning in a blended format may be linked with raising overall student achievement. Several advantages of learning in this format were identified for teachers and students, as well as challenges and difficulties. The learning format appeared to be an effective method of content delivery for students. **S**tudents taught in a blended format recorded an NCEA pass rate (Achieved or better) of 94%. Students in similar classes at the same school who were taught solely face-to-face recorded an NCEA pass rate of 77%. The performance of students taught in a blended format was particularly notable because the results from the blended learning class also surpassed the 81% average pass rate for the more practically oriented physical education achievement standards too. Analysis of participation records showed a strong link between online participation and NCEA achievement. Furthermore, during the post-course interviews, students clearly articulated their preference for blended learning and explained how the lessons met their learning needs. Several factors were identified as having a significant impact on the effectiveness of teaching in a blended format. These were: the readiness of the students to learn with technology, individual student ability, specific activities within the online module, technical difficulties and the role of the teacher. These

factors will be addressed in relation to the recommendations for schools, teachers and students considering a blended teaching and learning approach.

6.2 Limitations of the study

There were several limitations to this investigation. As an action research approach was used, the findings from this study are customised to the context and do not permit for the extrapolation of results to other classes, curriculum areas or secondary schools. The action research approach meant the researcher had a considerable influence on how the course and online module progressed. For example the online module was revised weekly, following mini cycles of action research which drew on feedback and observations to evaluate and inform the on-going module development.

A small and age specific single sex sample size was used and data obtained from the sample were only a snapshot of boys' participation and achievement at a specific time and place. The student perceptions, attitudes and experiences of blended learning at School A may not be applicable or transferable beyond the students who participated in this study; however every effort has been made to provide a rich description of the study to enable other researchers to interpret and translate the findings.

The unit of work was taught over a relatively short time period of only six weeks and only five students were interviewed. The students' views of their participation in the online module and face-to-face lessons were subjective and, as such, open to interpretation. Compounding this limitation is the myriad of factors which can influence individual participation such as the subject, student ability, the teacher, fellow learners and timing of the course.

6.3 Recommendations

Based on findings from the investigation, this chapter will outline important recommendations for school leaders, teachers and students for the effective implementation of blended learning at School A. The recommendations apply specifically to School A, however they are likely to be applicable to similar schools or students of similar age and same sex. Along with these recommendations, areas for further study will be suggested.

6.3.1 School leaders

This study suggests that learning physical education in a blended format was engaging for boys and contributed to improved achievement for Physical Education Achievement Standard 1.2. In order for blended learning to be effectively implemented, several key factors were identified at the school leadership level. Factors for consideration include: alignment of policies and strategies, resourcing (including time and technical support) and professional development.

Alignment of policies and strategies

Effective implementation of blended learning requires school leaders to be fully supportive of the use of ICT for education. The ICT action plan contains a list of key goals for the effective use of ICT for education. This ICT action plan is based on the New Zealand Curriculum, infrastructure, philosophy of ICT use for education and the needs of the students. The alignment of this action plan to pedagogy is crucial for the effective implementation of blended learning. This study highlighted the need for adequate resourcing and professional development in order for blended learning to be effectively implemented. These points will be discussed in the sections below.

Resourcing

Effective implementation of blended learning requires school leaders to be fully supportive, not just in developing and implementing relevant educational policies but also via resourcing. Adequate technical infrastructure, and acknowledging the time commitment required to develop and teach in a blended format are two key areas which could be improved to support and enable successful blended learning.

One of the key goals from the ICT action plan is to build a fast, reliable and resilient infrastructure to support teaching and learning. The inability of the technological infrastructure to meet the demands of students learning in the blended course was evident, and this inadequacy was viewed by the classroom teacher as a significant hurdle to teaching with technology. Reliable infrastructure and the provision of technical support are critical success factors for both staff and students' use of blended learning. Technical difficulties, for example slow or unreliable network servers, represent significant barriers to staff and students for effective blended learning. Inadequate or unreliable infrastructure is a deterrent to teachers contemplating the implementation of blended learning and is often cited in the literature (Al-Senaidi, Lin, & Poirot, 2009; Boss, 2008). It is imperative that teachers have confidence in the technological infrastructure if they are to implement blended learning approaches effectively. Similarly students also have high expectations for a fast reliable network and are quickly frustrated by technical problems (Volery & Lord, 2000; Wentling et al., 2007). School leaders should be aware of the necessary costs of blended learning, which include technical and administrative support, adequate hardware, software and internet access (Garrison & Kanuka, 2004).

The additional preparation and teaching time required for teaching an online module was highlighted in the present study. Initial course preparation time was significantly higher for the lessons taught online than the preparation time for face-to-face teaching. The higher demands of teaching the online module were also evident as student contact time is not bound by the length of the scheduled class period. Students could, and were expected to, contribute material to be viewed and graded by the teacher outside of the scheduled class teaching periods and this resulted in a higher volume of visible

student work. It is likely this workload would increase as the number of students in the course increased. Allocation of time or some form of compensation to teachers of blended learning classes may be needed, especially in the early stages of blended learning implementation.

Professional development

This action research investigation describes the critical role of the classroom teacher to enable successful blended learning. Teachers with little experience of blended learning may not make an easy transition to teaching lessons in an online module and not all teachers will see the value of blended learning or will be prepared to teach in this format. Blended learning brings new responsibilities and roles to teachers who already have significant workloads and may be unwilling or ill-equipped to change (Alebaikan & Troudi, 2010; Ocak, 2011). This study highlighted the need for school-wide professional development to improve teachers' understanding, capability and confidence in relation to blended learning pedagogies. Implementing specific teacher professional development, mentoring and coaching for all teaching staff embarking on a blended learning approach has been recommended in the literature (Maddox, 2009). Educating teachers on the many benefits of blended learning, such as increased achievement and personalisation of learning, are essential focusses for professional development. Further professional development should focus on effective teaching and pedagogy as opposed to technical skill development (Bonk, 2001; Law, 2009).

Action to improve the technological infrastructure and the introduction of targeted teacher professional development in the ICT action plan are likely to enhance students' blended learning experience. These two issues from School A are potentially likely to be experienced by other New Zealand schools considering blended learning approaches.

6.3.2 Teachers

The inter-connected roles of the classroom teacher and researcher in his role as an online module designer, were critical and challenging features of teaching in a blended format. The teacher and the online module designer need to have shared understandings of pedagogy, student support and encouragement, and knowledge of boys' education.

Support and encouragement for students were important factors in the effectiveness of teaching in a blended format. For students at School A their primary form of instruction is conducted in the traditional face-to-face manner. Therefore supporting students to feel comfortable and confident to participate in the online lessons was a goal for the first phase of the course. Ng (2008) also notes it may be appropriate for the instructional design of an online module to have more structure at the beginning, before embarking on more open and socially constructed modes of instruction. The classroom teacher was also very supportive and encouraging to students throughout the online

lessons. His presence, willingness to help and encouragement of students was beneficial for students' learning. Scaffolding younger students to develop skills to become autonomous and self-regulating learners is one of the most important factors contributing to successful online learning (Schrum & Hong, 2002).

Student participation was generally high in the online module, but some students needed further support to encourage participation. Beginning with a more formal expectation of participation, for example using a learning contract (Elbaum et al., 2002), or apportioning an aspect of the final grade to online participation (Bullen, 2007), may have encouraged wider participation in the present study. Careful design to provide a structured approach may be particularly suited to teaching adolescent boys in a blended format. Literature indicates boys tend to prefer a learning environment with specific expectations and clear boundaries (Irwin, 2009; Rowe & Rowe, 2002).

Using a student centred social constructivist pedagogy was a key factor in the success of the online module. Students enjoyed the opportunity to construct their own knowledge via collaboration with peers when learning via the online module, and co-operative learning is an important aspect of an online setting (Augar, Raitman, & Zhou, 2011; Elbaum et al., 2002; Johnson, Johnson, & Stanne, 2000). To complement this constructivist approach to online lessons, a student centred teaching style appears to be an effective approach in face-to-face lessons as well. Encouraging students of blended learning to engage with peer and teacher discussions in the face-to-face setting has been reported to reduce difficulty for students in communicating online (Dantas & Kemm, 2008; O Dwyer et al., 2007; Parkes et al., 2011).

Teaching in a blended format requires a consistent approach to learning from the online module designer and classroom teacher. In the present study, online and face-to-face lessons were planned and taught by two different teachers. This approach may explain a perceived lack of value of the online lessons by the classroom teacher. Research is critical of blended learning courses where the face-to-face teacher has had little input to online lessons (Snart, 2010). Ideally the lessons taught in an online module should reflect or at least complement classroom teacher's interests, teaching style and tone. If the classroom teacher takes responsibility for both the face-to-face and online teaching, consistency of pedagogy and instructional value are likely to be maintained. However, a team teaching approach where the online module designer and classroom teacher have a shared understanding of best practice of teaching and the importance of teaching mode would also be an effective approach.

Specific activities within the online module encouraged participation. Findings from this study confirmed research highlighting the value of quizzes and discussion forums. High

levels of participation in these activities are likely to be related to improvements in achievement. Discussion forums have the potential to support students' learning and achievement but students need to be equipped to gain from discussion forums. Two suggested strategies are teacher modeling of effective discussions, and pairing less able learners with those who are using discussions more strategically (Ellis & Calvo, 2004). Quizzes were beneficial for student learning and an accurate predictor of overall achievement. Teachers are recommended to use quizzes as a tool to practice for test conditions and to help reduce anxiety (Itoh & Hannon, 2002). In addition to providing valuable feedback to the students about how they are doing, data from online quizzes may be used by the course teacher to identify and help students who are most likely to perform poorly in summative assessments. Tracking student online activity provides valuable feedback for teachers of blended learning courses to help to predict end of course achievement (Milne, Jeffrey, Suddaby, & Higgins, 2012).

6.3.3 Students

The open nature of blended learning can be challenging for secondary school aged students. Learning in a non-traditional environment, the need for independence and the organizational and management skills required to successfully learn from an online module are a shift from traditional face-to-face learning (Nicholas & Ng, 2009). Although blended learning can be challenging, this form of learning aligns consistently with the New Zealand Curriculum's directions for learning. The New Zealand Curriculum states 21st century students should develop several key competencies, many of which can be developed via learning in a blended format. As blended learning increases learning flexibility, students are required to self-manage, contribute and participate to their learning in an environment and timeline best suited to their individual learning needs. Blended learning provides students with different opportunities to use appropriate tools such as language, symbols and text and learn new skills of interacting with others.

6.4 Further research

This research examined boys' achievement and analysed their online participation when studying physical education in a blended format. Results purported a relationship exists between online participation and NCEA achievement, and found that student achievement was higher for students taught in a blended format compared with those who were taught solely face-to-face.

Recommendations emanating from the study include further blended learning research on achievement and participation among different groups of students in different schools. Longitudinal studies of blended learning at secondary school are recommended to understand the long-term effectiveness of blended approaches of learning. Blended learning may be best suited to older students, or teachers who have a particular interest in using technology for education. The role of the teacher in a blended learning course requires deeper investigation and understanding. A similar

investigation looking specifically at the teacher who plans and teaches the online and face-to-face lessons may give a more accurate understanding of the blended teacher's role.

The achievement of boys at secondary school in New Zealand has been a significant educational issue for decades. There is evidence to suggest that technology is engaging for boys and this study has revealed that blended learning is an effective method of instruction for teaching boys, particularly in relation to theoretical aspects of physical education. There is no 'one size fits all' solution to improving boys' achievement; however other learning areas may benefit from this form of learning too. Given the growth of blended teaching and learning in educational institutions (Horn & Staker, 2011) and the limited research focusing on blended learning at schools (Means et al., 2009), further and more detailed research is recommended. As on-going research continues to document the effectiveness of blended learning, educators will be challenged to embrace new teaching methodologies.

References

Abbiss, J. (Producer) (Writer). (2011). Ethics introduction audio [Audio podcast]. Christchurch, New Zealand.

Al-Senaidi, S., Lin, L., & Poirot, J. (2009). Barriers to adopting technology for teaching and learning in Oman. *Computers & Education, 53*(3), 575-590.

Albrecht. (2006). Enriching student experience through blended learning. *Centre for Applied Research, 2006*(12), 1-12.

Alebaikan, R., & Troudi, S. (2010). Blended learning in Saudi universities: challenges and perspectives. *ALT-J Research in Learning Technology, 18*(1), 49-59.

Ally, M. (2004). Foundations of educational theory for online learning. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (pp. 3-31). Athabasca, Athabasca University, Edmonton, AB: AU Press.

Altrichter, H., Posch, P., & Somekh, B. (1993). *Teachers investigate their work: an introduction to the methods of action research*. New York: Routledge.

Alzaghoul, A. F. (2012) The Implication of the learning theories on implementing e-learning courses. *The Research Bulletin of Jordan ACM, 11*(11), 27-30.

Anderson, T. (2004). Teaching in an online learning context. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (pp. 271-294). Athabasca, Athabasca University: AU Press.

Anderson, T. (2008). *The theory and practice of online learning*. Athabasca University, Athabasca: Au Press.

Appana, S. (2008). A review of benefits and limitations of online learning in the context of the student, the instructor, and the tenured faculty. *International Journal on E-Learning, 7*(1), 5-22.

Argyris, C., Putnam, R., & Smith, D. (1985). *Action Science: Concepts, methods and skills for research and intervention*. San Francisco, CA: Jossey-Bass.

Augar, N., Raitman, R., & Zhou, W. (2004). Teaching and learning online with wikis. *Proceedings of the 21st Australiasian Society for computers in Learning in Tertiary Education (ASCILITE) Conference*, Perth: December 5-8, 95-104. Retrieved August 2012 from http://www.ascilite.org.au/conferences/perth04/procs/pdf/augar.pdf

Avison, D. E., Lau, F., Myers, M. D., & Axel Nielsen, P. (1999). Action research. *Communications of the ACM, 42*(1), 94-97. doi: 10.1145/291469.291479

Baimba, A. (1992). Physics teachers' action-research experience with a teaching module on "Force". *Research in Science Education, 22*(1), 30-37. doi: 10.1007/bf02356876

Barbour, M. (2010). *Perspectives on e-learning: Development and challenges of K-12 online learning*. Paper presented at the Society for Information Technology & Teacher Education International Conference 2010, San Diego, CA. http://www.editlib.org/p/33355

Barbour, M. K., & Reeves, T. C. (2009). The reality of virtual schools: A review of the literature. *Computers & Education, 52*(2), 402-416.

Bates, T. (2005). Technology, e-learning and distance education. London, United Kingdom: Routledge.

Belanger, Y. (2002). Laptop computers in the K-12 classroom. *Teacher Librarian, 29*(4), 31-33.

Bento, R., & Schuster, C. (2003). Participation: The online challenge. In A. Aggarwal (Ed.), *Web-based education: Learning from experience* (pp. 156-164). Hershey PA: IRM Press.

Berge, Z. L. (1998). Barriers to online teaching in post-secondary institutions: Can policy changes fix it? *The Online Journal of Distance Learning Administration, 1*(2). Retrieved from http://www.westga.edu/~distance/ojdla/summer12/berge12.html

Biklen, S. K., & Bogdan, R. (2007). *Qualitative research for education: an introduction to theories and methods*. Boston, MA: Pearson A & B.

Blaxter, L., Hughes, C., & Tight, M. (2010). *How to research*. Buckingham, United Kingdom: Open University Press.

Bolstad, R., & Gilbert, J. (2006). Creating digital age learners through school ICT projects: What can the Tech Angels project teach us? *Education Counts*. Wellington: New Zealand Council for Educational Research.

Bolstad, R., & Lin, M. (2009). *Students' experiences of learning in virtual classrooms* Retrieved June 3, 2012, from http://www.nzcer.org.nz/pdfs/students-experiences-learning-virtual-classrooms.pdf

Bonk, C. J. (2001). *Online teaching in an online world*. Bloomington, IN: CourseShare.com.

Bonk, C. J., Kirkley, J., Hara, N., & Dennen, V. (2000). *Advances in Pedagogy: Finding the Instructor in post-secondary online learning.* Paper presented at the American Educational Research Association,, New Orleans, LA.

Boss, S. (2008). *Overcoming technology barriers: How to innovate without extra money or support.* Retrieved September 18, 2012, from http://www.edutopia.org/technology-how-to-implement-classroom

Boyce, B. (1992). The effects of three styles of teaching on university students' motor performance. *Journal of Teaching in Physical Education, 11*(4), 389-401.

Boyde, K. (2012). Blended learning in secondary schools is a start in the right direction. *Computers in New Zealand Schools, 24*(1), 40-53.

Boyle, T., Bradley, C., Chalk, P., Jones, R., & Pickard, P. (2003). Using blended learning to improve student success rates in learning to program. *Journal of Educational Media, 28*(2-3), 165-178.

Brindley, J. E., Blaschke, L. M., & Walti, C. (2009). Creating effective collaborative learning groups in an online environment. *International Review of Research in Open and Distance Learning, 10*(3), 1-18

Briscoe, C., & Wells, E. (2002). Reforming primary science assessment practices: A case study of one teacher's professional development through action research. *Science Education, 86*(3), 417-435.

Brown, J., Murphy, J., & Noble, C. (2001). *How to raise boys' achievement*. London, United Kingdom: David Fulton.

Bullen, M. (2007). Participation and critical thinking in online university distance education. *The Journal of Distance Education/Revue de l'Éducation à Distance, 13*(2), 1-32.

Burd, B. A., & Buchanan, L. E. (2004). Teaching the teachers: teaching and learning online. *Reference Services Review, 32*(4), 404-412.

Burns, A. (1999). *Collaborative action research for English language teachers*. Cambridge, N.Y.: Cambridge University Press.

Callaghan, N., & Bower, M. (2012). Learning through social networking sites – the critical role of the teacher. *Educational Media International, 49*(1), 1-17. doi: 10.1080/09523987.2012.662621

Carr, W., & Kemmis, S. (1986). *Becoming critical: Education, Knowledge and Action Research. London: Falmer*.

Cavanaugh, C., Gillan, K. J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on K–12 student outcomes: A meta-analysis.* Retrieved from http://faculty.education.ufl.edu/cathycavanaugh/docs/EffectsDLonK-12Students1.pdf

Cavanaugh, J. (2005). Teaching online - A time comparison. *Online Journal of Distance Learning Administration, 8*(1). Retrieved September 1, 2012, from https://www.westga.edu/~distance/ojdla/spring81/cavanaugh81.htm

Chandra, V., & Fisher, D. L. (2009). Students' perceptions of a blended web-based learning environment. *Learning Environments Research, 12*(1), 31-44.

Chandra, V., & Lloyd, M. (2008). The methodological nettle: ICT and student achievement. *British Journal of Educational Technology, 39*(6), 1087-1098.

Cheung, L. L. W., & Kan, A. C. N. (2002). Evaluation of factors related to student performance in a distance-learning business communication course. *The Journal of Education for Business, 77*(5), 257-263.

Cohen, E. G. (1994). Restructuring the classroom: Conditions for Productive Small Groups. *Review of educational research, 64*(1), 1-35.

Coldwell, J., Craig, A., Patterson, T., & Mustard, J. (2008). Online students: Relationships between participation, demographics and academic performance. *Electronic journal of e-learning, 6*(1), 19-30.Retrieved November 8, 2012, from http://www.ejel.org/volume6/issue1

Coleman, B. (1995). *An investigation into aspects of the Community Work Diploma, Christchurch Polytechnic.* Unpublished Master's thesis, University of Canterbury, Christchurch, New Zealand. Retrieved from http://ir.canterbury.ac.nz/handle/10092/2426

Collins, S. (2012). Schools do their bit to cut crime. Retrieved December 31, 2012

Collis, B., & Moonen, J. (2002). Flexible learning in a digital world. *Open Learning, 17*(3), 217-230.

Cram, F. (2001). Rangahau Maori: Tona Tika, tona pono - The validity and integrity of Maori research. *In M. Tolich Research ethics in Aotearoa New Zealand* (pp. 35-52). Auckland, New Zealand: Pearson Education.

Culpan, I., & McBain, S. (2012). Constructivist pedagogies for Olympism education. *Asia-Pacific Journal of Health, Sport and Physical Education, 3*(2), 95-108.

Cunningham, J. B. (1993). *Action research and organizational development*: Praeger Westport, CT.
Cuttance, P., & Thompson, J. (2007). *Literature review of boys' education*. Wellington, New Zealand: Retrieved from https://www.victoria.ac.nz/education/pdf/whakapiki/boys_ed_lit_rev_nz.pdf.
Dantas, A. M., & Kemm, R. E. (2008). A blended approach to active learning in a physiology laboratory-based subject facilitated by an e-learning component. *Advances in Physiology Education, 32*(1), 65-75.
Daum, D. N., & Buschner, C. (2012). The status of high school online physical education in the United States. *Journal of Teaching in Physical Education, 31*(1), 86-100.
Davies, A., Ramsay, J., Lindfield, H., & Couperthwaite, J. (2005). A blended approach to learning: added value and lessons learnt from students' use of computer-based materials for neurological analysis. *British Journal of Educational Technology, 36*(5), 839-849. doi: 10.1111/j.1467-8535.2005.00506.x
Davies, J., & Graff, M. (2005). Performance in e-learning: online participation and student grades. *British Journal of Educational Technology, 36*(4), 657-663.
Davis, N., & Niederhauser, D. (2006). *Preparing teachers for K-12 distance learning: Roles and strategies.* Paper presented at the 22nd Annual conference on distance teaching and learning, Madison, Wisconsin, USA. Retrieved from http://www.uwex.edu/disted/conference/Resource_library/proceedings/06_4128.pdf
Davis, N., & Niederhauser, D. S. (2007). Virtual schooling. *Learning and Leading with Technology, April*.
Davison, M. M. (2005). Distance education in high schools: Benefits, challenges, and suggestions. *The Clearing House, 78*(3), 105-108.
de la Varre, C., Keane, J., & Irvin, M. J. (2011). Dual perspectives on the contribution of on-site facilitators to teaching presence in a blended learning environment. *Journal of Distance Education, 25*(3), 1-13.
Deery, R. (2011). Is action research real research? Retrieved April 19, 2012, from http://www.nmh.uts.edu.au/cmcfh/news-events/rdeery.pdf
Denscombe, M. (2002). *Ground rules for good research: a 10 point guide for social researchers.* Phildelphia, PA: Open University Press.
Denzin, N. K., & Lincoln, Y. S. (2000). *The discipline and practice of qualitative research*. Thousand Oaks, CA: Sage.
DiPietro, M., Ferdig, R. E., Black, E. W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning, 7*(1), 10-35.
Dobson, J. L. (2008). The use of formative online quizzes to enhance class preparation and scores on summative exams. *Advances in Physiology Education, 32*(4), 297-302.
Dziuban, C., & Moskal, P. (2001). Evaluating distributed learning at metropolitan universities. *Educause Quarterly, 24*(4), 60-61.
Dziuban, C. D., Hartman, J. L., & Moskal, P. D. (2004). Blended learning. *ECAR Research Bulletin, 7* Retrieved August 14, 2012, from http://net.educause.edu/ir/library/pdf/erb0407.pdf
Eden, C., & Huxham, C. (2005). Action research for management research. *British Journal of Management, 7*(1), 75-86.
Education Review Office. (2008). *Boy's education: good practice in secondary schools*. Wellington, New Zealand: Education Review Office.
Elbaum, B., McIntyre, C., & Smith, A. (2002). *Essential elements: Prepare, design, and teach your online course*. Madison, WI: Atwood.
Ellis, R., & Calvo, R. (2004). Learning through discussions in blended environments. *Educational Media International, 41*(3), 263-274.
Feinstein, L. (2003). Inequality in the early cognitive development of British children in the 1970 cohort. *Economica, 70*(277), 73-97.
Ferrance, E. (2000). *Action research*. Northeast and Islands Regional Educational Laboratory At Brown University. Providence. Retrieved from http://www.lab.brown.edu/pubs/themes_ed/act_research.pdf
Field, T. (2010). *CTE-Action research.* Paper presented at the Action Research Workshop, Perak Matriculation College.
Fox, R. (2006). *Boys - the classroom timebomb*. Retrieved March 25, 2012, from http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10382701

Francis, B. (2000). *Boys, girls, and achievement: Addressing the classroom issues*. New York, N.Y.: RoutledgeFalmer.

Fredericksen, E., Pickett, A., Shea, P., Pelz, W., & Swan, K. (2000). Student satisfaction and perceived learning with on-line courses: Principles and examples from the SUNY learning network. *Journal of Asynchronous Learning Networks, 4*(2), 7-41.

Fritz, K. M. (2003). *Using Blackboard 5 to deliver both traditional and multimedia quizzes on-line for the foreign language class.* ERIC Document Reproduction No. ED482584.

Garrison, D. R. (2011). *E-learning in the 21st century: A framework for research and practice*. Taylor & Francis.

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *Internet and Higher Education, 7*(2), 95-105.

Gatman, V. (2005). Physical activity and physical education within *Health and Physical Education in the New Zealand Curriculum: A primary school teacher's perspective* Retrieved November 3, 2012, from www.nzcurriculum.tki.org.nz/content/download/460/3642/file/gateman-hpepaper.doc

Gaudioso, E., Hernandez-del-Olmo, F., & Montero, M. (2009). Enhancing e-learning through teacher support: Two experiences. *Education, IEEE Transactions on, 52*(1), 109-115.

Geer, R. (2005). *Imprinting and its impact on online learning environments.* Paper presented at the Ascilite 2005: Balance, Fidelity and Mobility and Maintaining the Momentum, QUT, Brisbane, Queensland.

Genc Ilter, B. (2009). Effect of technology on motivation in EFL classrooms. *The Turkish Online Journal of Distance Education, 10*(4), 136-158.

Goertzen, P., & Kristjánsson, C. (2007). Interpersonal dimensions of community in graduate online learning: Exploring social presence through the lens of Systemic Functional Linguistics. *The Internet and Higher Education, 10*(3), 212-230. doi: 10.1016/j.iheduc.2007.06.005

Gorham, J., & Millette, D. M. (1997). A comparative analysis of teacher and student perceptions of sources of motivation and demotivation in college classes. *Communication Education, 46*(4), 245-261.

Gough-Jones, V. J. (2008). *Girls' perceptions of secondary school specialist computer courses: A case study.* Unpublished master's thesis, Canterbury, Christchurch.

Graham, C. (2006). Blended learning systems. In C. Bonk & C. Graham (Eds.), *Handbook of blended learning: Global Perspectives, local designs*. San Francisco, CA: Pfeiffer Publishing.

Gresham, P., & Gibson-Langford, L. (2012). Competition, games, technology - boys are loving English. *English in Australia, 47*(1), 81-89.

Gunn, C., McSporran, M., Macleod, H., & French, S. (2003). Dominant or different: Gender issues in computer supported learning. *Journal of Asynchronous Learning Networks, 7*(1), 14-30.

Hannum, W. H., Irvin, M. J., Lei, P. W., & Farmer, T. W. (2008). Effectiveness of using learner-centered principles on student retention in distance education courses in rural schools. *Distance Education, 29*(3), 211-229.

Hansmann, S. (2006). Qualitative case method and web-based learning: The application of qualitative research methods to the systematic evaluation of web-based learning assessment results. *Selected styles in web-based educational research*, 91-110.

Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (2004). Why public schools lose teachers. *Journal of Human Resources, 39*(2), 326-354.

Hara, N., & Kling, R. (2001). Student distress in web-based distance education. *Educause Quarterly, 24*(3), 68-69.

Harms, C. M., Niederhauser, D. S., Davis, N. E., Roblyer, M.D., & Gilbert, S. B. (2006). Educating educators for virtual schooling: Communicating roles and responsibilities. *The Electronic Journal of Communication, 16*(1-2).

Harnett, J. A. (2008). *Changing learning conversations: an action research model of reflective professional development.* Massey University, Auckland, New Zealand.

Hartley, J. (1998). *Learning and studying: A research perspective*. London, United Kingdom: Routledge.

Hattie, J. (2003). *Teachers make a difference: what is the research evidence?* Retrieved March 9, 2012, from http://www.decd.sa.gov.au/limestonecoast/files/pages/new%20page/PLC/teachers_make_a_difference.pdf

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-

112.
Haughton, E. (2002). Hitting the right button. Retrieved August 21, 2012, from http://www.guardian.co.uk/education/2002/nov/19/elearning.technology
Haythornthwaite, C., Kazmer, M. M., Robins, J., & Shoemaker, S. (2000). Community development among distance learners: Temporal and technological dimensions. *Journal of Computer Mediated Communication, 6*(1), Retrieved December 20, 2012 from http://www.ascusc.org/jcmc/vol6/issue1/haythornthwaite.html..
Hedberg, J. G. (2006). E-learning futures? Speculations for a time yet to come. *Studies in Continuing Education, 28*(2), 171-183.
Heinze, A., & Procter, C. (2004). *Reflections on the use of blended learning*. Paper presented at the Conference on Education in a Changing Environment, University of Salford, United Kingdom.
Hendricks, C. (2009). *Improving schools through action research: a comprehensive guide for educators*. Upper Saddle River, N.J: Pearson.
Hiltz, S. R., Coppola, N., Rotter, N., & Turoff, M. (2000). Measuring the importance of collaborative learning for the effectiveness of ALN: a multi-measure, multi-method approach. Journal of Asynchronous Learning Networks, 4(2), http://www.sloan-c.org/publications/jaln/v4n2/v4n2_hiltz.asp.
Hiltz, S. R., Coppola, N., Rotter, N., & Turoff, M. (2000). Measuring the importance of collaborative learning for the effectiveness of ALN: a multi-measure, multi-method approach. *Journal of Asynchronous Learning Networks,* 4(2), http://www.sloan-c.org/ publications/jaln/v4n2/v4n2_hiltz.asp.
Hofmann, J. (2006). Why blended learning hasn't (yet) fulfilled its promises: Answers to those questions that keep you up at night. In C. J. Bonk & C. R. Graham (Eds.), *The handbook of blended learning*. Global perspectives, local designs (pp. 27–40). San Francisco: Pfeiffer.
Hofman, J. (2006). Why blended learning hasn't yet fulfilled its promises: Answers to those questions that keep you up at night. In C. J. Bonk & C. R. Graham (Eds.), *The handbook of blended learning*. San Franciso, CA: Pfeiffer.
Horn, M. B., & Staker, H. (2011). The rise of K–12 blended learning. *Innosight Institute, 7*.
Hrastinski, S. (2008). What is online learner participation? A literature review. *Computers & Education, 51*(4), 1755-1765.
Hruby, G. G. (2001). Sociological, postmodern, and new realism perspectives in social constructionism: Implications for literacy research. *Reading Research Quarterly, 36*(1), 48-62.
Hughes, C., di Corpo, S., & Hewson, L. (2006). *Online facilitation: Strategies for gaining engagement in different OLEs.* Paper presented at the Proceedings of the 23rd Annual ASCILITE Conference: Who's learning? Whose technology, Sydney, Australia.
Hughes, J. E., McLeod, S., Brown, R., Maeda, Y., & Choi, J. (2007). Academic achievement and perceptions of the learning environment in virtual and traditional secondary mathematics classrooms. *American Journal of Distance Education, 21*(4), 199-214. doi: 10.1080/08923640701595365
Irizarry, R. (2002). Self-efficacy and motivation effects on online psychology student retention. *Usdla Journal, 16*(12), 55-64.
Irwin, M. (2009). *Educating boys: helping Kiwi boys to succeed at school*. Auckland, New Zealand: HarperCollins.
Itoh, R., & Hannon, C. (2002). The effect of online quizzes on learning Japanese. *Calico Journal, 19*(3), 551-562.
Jiang, M., & Ting, E. (2000). A study of factors influencing students' perceived learning in a web-based course environment. *International Journal of Educational Telecommunications, 6*(4), 317-338.
Johnson, Johnson, & Stanne, M. B. (2000). Cooperative learning methods: A meta-analysis. *Minneapolis, MN: University of Minnesota. Retrieved April, 1*, 2004. Retrieved from http://www.co-operation.org/pages/cl-methods.html
Johnson, A. (2005). *A short guide to action research (3rd edition)*. Boston. MA: Pearson Allyn and Bacon.
Johnson, G. M. (2006). Optional online quizzes: College student use and relationship to achievement. *Canadian Journal of Learning and Technology 32*(1):1-11.
Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26.

Kachel, D., E., Henry, N., L., & Keller, C., A. (2005). Making it real online: Distance learning for high school students. *Knowledge Quest, 34*(1), 14-17.

Kane, J. J. (2004). My dog ate the disk: An analysis of student and teacher perspectives of an online personal fitness course. *Florida Journal of Health, Physical Education, Recreation and Dance, 42*(2), 8-12.

Karp, G. G., & Woods, M. L. (2003). Wellness NutriFit online learning in physical education for high school students. *The Journal of Interactive Online Learning, 2*(2), 1-19.

Keen, A. (2005). *Exploring the potential of a writing group to encourage academic staff and postgraduate students to publish.* University College Chester. Retrieved from http://hdl.handle.net/10034/84834

Keller, S. (2011). *Teaching methods at single sex high schools: An analysis of the implementation of biological differences and learning styles.* Senior Theses, Trinity College, Hartford, CT. Retrieved from http://digitalrepository.trincoll.edu/theses/48

Kemmis, S., & McTaggart, R. (1988). *The action research planner*. Waurn Ponds, Victoria, Australia: Deakin University Press.

Kenny, A. (2002). Online learning: enhancing nurse education? *Journal of Advanced Nursing, 38*(2), 127-135.

Kenway, J., & Fitzclarence, L. (1997). Masculinity, violence and schooling: Challenging 'poisonous pedagogies'. *Gender and Education, 9*(1), 117-134.

Kerka, S. (1996). Distance learning, the internet, and the world wide web. *ERIC Digest*. (ERIC Document Reproduction Service No. ED395214). Retrieved June 14, 2012, from http://techedu.huji.ac.il/techedu/talmidim/ezra/Distance%20Learning,%20the%20Internet,%20and%20the%20World%20Wide%20Web.htm

Kibble, J. D. (2011). Voluntary participation in online formative quizzes is a sensitive predictor of student success. *Advances in Physiology Education, 35*(1), 95-96.

King, K., & Gurian, M. (2006). Teaching to the minds of boys. [Article]. *Educational Leadership, 64*(1), 56-61.

Korkmaz, Ö., & Karakus, U. (2009). The impact of blended learning model on student attitudes towards geography course and their critical thinking dispositions and levels. *The Turkish Online Journal of Educational Technology, 8*(4), 51-63.

Kulinna, P. H., & Cothran, D. J. (2003). Physical education teachers' self-reported use and perceptions of various teaching styles. *Learning and Instruction, 13*(6), 597-609.

Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2001). A comprehensive meta-analysis of the predictive validity of the Graduate Record Examinations: Implications for graduate student selection and performance. *Psychological Bulletin, 127*(1), 162-181.

Lai, K. W., & Pratt, K. (2009). Technological constraints and implementation barriers of using videoconferencing for virtual teaching in New Zealand secondary schools. *Journal of Technology and Teacher Education, 17*(4), 505-522.

Lashlie, C. (2005). *He'll be OK: growing gorgeous boys into good men*. Auckland [N.Z.]: HarperCollins.

Laurillard, D. (1995). Multimedia and the changing experience of the learner. *British Journal of Educational Technology, 26*(3), 179-189. doi: 10.1111/j.1467-8535.1995.tb00340.x

Law, N. (2009). Mathematics and science teachers' pedagogical orientations and their use of ICT in teaching. *Education and Information Technologies, 14*(4), 309-323.

Legault, L., Green-Demers, I., & Pelletier, L. (2006). Why do high school students lack motivation in the classroom? Toward an understanding of academic amotivation and the role of social support. *Journal of Educational Psychology, 98*(3), 567.

Taylor, C., & Gibbs, G. R. (2010). What is qualitative data analysis (QDA)? Retrieved March 15, 2012, from http://onlineqda.hud.ac.uk/Intro_QDA/what_is_qda.php

Lewis, B. (2002). The effectiveness of discussion forums in online learning. *Brazilian Review of Open and Distance Learning, 1*(1), 1-11.

Lim, P. T. H. (2007). Action research for teachers: A balanced model. *Paper presented at the Redesigning Pedagogy: Culture, Knowledge and Understanding Conference* 2007. Singapore. Retrieved January 29, 2012, from http://conference.nie.edu.sg/2007/paper/papers/OTH154.pdf

Lindsay, G., & Muijs, D. (2006). Challenging underachievement in boys. *Educational Research, 48*(3), 313-332.

Littleton, K., Wood, C., & Chera, P. (2006). Interactions with talking books: phonological awareness affects boys' use of talking books. *Journal of Computer Assisted Learning, 22*(5), 382-390.

Mackey, J. (2009). Virtual learning and real communities: Online professional development for teachers. *Effective blended learning practices: Evidence based perspectives in ICT-facilitated education*, 163-181.

Maddox, M. (2009). Blended learning: The internet and the classroom. *Principal Leadership, 10*(4), 72-74.

Maor, D. (2003). The teacher's role in developing interaction and reflection in an online learning community. *Educational Media International, 40*(1-2), 127-137. doi: 10.1080/0952398032000092170

Marshall, C., & Rossman, G. B. (1995). *Designing qualitative research*. Thousand Oaks, CA.: Sage Publications.

Mazzolini, M., & Maddison, S. (2003). Sage, guide or ghost? The effect of instructor intervention on student participation in online discussion forums. *Computers & Education, 40*(3), 237-253.

McFarland, K. P., & Stansell, J. C. (1993). *Historical perspectives*. Newark, DE: International Reading Association.

McKay, J., & Marshall, P. (2002). The poverty of action research in information systems. *Synergy Matters*, 187-192.

McKenzie, B. K., & Roblyer, M. (2000). Distant but not out of touch: What makes an effective distance learning instructor? *Learning & Leading with Technology, 27*(6), 50-53.

McLellan, R. (2002). *An approach to tackling 'laddish' masculinity to raise boys' achievement at secondary school*. Paper presented at the BERA Conference, 15 to 18 September 2004, Manchester. http://www-rba.educ.cam.ac.uk/Paper%20RM.pdf

McNamara, J. M., Swalm, R. L., Stearne, D. J., & Covassin, T. M. (2008). Online weight training. *Journal of Strength and Conditioning Research, 22*(4), 1164-1168.

McNiff, J. (2002). Action research for professional development. Concise advice for new researchers. Retrieved May 3, 2012 from http://www.jeanmcniff.com/ar-booklet.asp

McNiff, J., & Whitehead, J. (2009). *You and your action research project*. London, England: Routledge.

McSporran, M., & Young, S. (2001). Does gender matter in online learning? *Association for Learning Technology Journal, 9*(2), 3-15.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Washington, D.C.

Melton, B., Graf, H., & Chopak-Foss, J. (2009). Achievement and satisfaction in blended learning versus traditional general health course designs. *International Journal for the Scholarship of Teaching and Learning, 3*(1).

Menter, I. (2011). *A guide to practitioner research in education*. London, United Kingdom: Sage Publications Ltd.

Mertler, C. A. (2006). *Action research: teachers as researchers in the classroom*. Thousand Oaks, CA: SAGE Publications.

Meyer, L. H. (2009). *Motivation and achievement at secondary school: The relationship between NCEA design and student motivation and achievement: a three year follow-up*. Wellington, New Zealand: Victoria University.

Milne, J. D., Jeffrey, L. M., Suddaby, G., & Higgins, A. (2012). *Early identification of students at risk of failing.* Paper presented at the ascilite, Wellington.

Ministry of Education. (2006). *enabling the 21st century learner: An eLearning action plan for schools 2006-2010*. Wellington New Zealand: Learning Media Limited.

Ministry of Education. (2007). *The New Zealand curriculum*. Wellington: Learning Media.

Mitchell, A., & Honore, S. (2007). Criteria for successful blended learning. *Industrial and Commercial Training, 39*(3), 143-149. doi: 10.1108/00197850710742243

Moller, L. (1998). Designing communities of learners for asynchronous distance education. *Educational Technology Research and Development, 46*(4), 115-122.

Moore, J. C. (2004). ALN principles for blended environments: A collaboration. The Sloan Consortium. Retrieved August 14, 2012, from http://www.sloan-c.org/publications/books/alnprinciples2.pdf

Morgan, P. L., Farkas, G., Hillemeier, M. M., & Maczuga, S. (2009). Risk factors for learning-related behavior problems at 24 months of age: Population-based estimates. *Journal of abnormal child psychology, 37*(3), 401-413.

Morris, L., Finnegan, C., & Wu, S. (2005). Tracking student behavior, persistence, and achievement in online courses. *The Internet and Higher Education, 8*(3), 221-231. doi:

10.1016/j.iheduc.2005.06.009
Moscinska, K., & Rutkowski, J. (2011). Barriers to Introduction of e-learning: a case study. In *Global Engineering Education Conference (EDUCON) 2011 IEEE* (p. 460-465). IEEE.
Mosston, M., & Ashworth, S. (2002). *Teaching physical education*. San Francisco, CA: Cummings.
New Zealand Qualifications Authority. (2011). *Annual report on NCEA & New Zealand scholarship data and statistics 2009*. Wellington: Ministry of Education.
National Association for Sport and Physical Education [NASPE]. (2007). Initial guidelines for online physical education [Position Paper]. Reston, VA: Author.
Ng, W. (2008). Self-directed learning with web-based sites: How well do students perceptions and thinking match their teachers? *Teaching Science, 54*(2), 24-27.
Nicholas, H., & Ng, W. (2009). Engaging secondary school students in extended and open learning supported by online technologies. *Journal of Research on Technology in Education, 41*(3), 305-328.
Nicol, D., Minty, I., & Sinclair, C. (2003). The social dimensions of online learning. *Innovations in education and Teaching International, 40*(3), 270-280.
Nolen, A. L., & Putten, J. V. (2007). Action research in education: Addressing gaps in ethical principles and practices. *Educational researcher, 36*(7), 401-407.
North, R. F. J., Strain, D., & Abbott, L. (2001). Training teachers in computer-based management information systems. *Journal of Computer Assisted Learning, 16*(1), 27-40.
O Dwyer, L. M., Carey, R., & Kleiman, G. (2007). A study of the effectiveness of the Louisiana Algebra I online course. *Journal of Research on Technology in Education, 39*(3), 289.
O'brien, R. (1998). *An overview of the methodological approach of action research*. Unpublished paper to Professor Joan Cherry, Course LIS3005Y. Faculty of Information Studies, University of Toronto, Retrieved April 17, 2012 from http://www.web.ca/~robrien/papers/xx%20ar%20final.htm
Oblender, T. E. (2002). A Hybrid course model. *Learning and Leading with Technology, 29*(6), 42-46.
Oblinger, D., & Oblinger, J. L. (2005). *Educating the net generation.* Retrieved from http://www.educause.edu/educatingthenetgen
Ocak, M. A. (2011). Why are faculty members not teaching blended courses? Insights from faculty members. *Computers & Education, 56*(3), 689-699.
Office of Research. (n. d.). *Human Subjects Committee* Retrieved September 12, 2011, from http://www.research.fsu.edu/humansubjects/faq/index.html
Oliver, R. (1999). On-line teaching and learning: New roles for participants. Retrieved August 23, 2012, from http://www.monash.edu.au/groups/flt/1999/online.html
Orey, M. (2002). *Emerging perspectives on learning, teaching and technology*. Retrieved January 9, 2012, from http://textbookequity.com/oct/Textbooks/Orey_Emergin_Perspectives_Learning.pdf
Owston, R., Wideman, H., Murphy, J., & Lupshenyuk, D. (2008). Blended teacher professional development: A synthesis of three program evaluations. *The Internet and Higher Education, 11*(3-4), 201-210.
Padilla-Walker, L. M. (2006). The impact of daily extra credit quizzes on exam performance. *Teaching of Psychology, 33*(4), 236-239.
Palloff, R. M., & Pratt, K. (1999). *Building learning communities in cyberspace*. San Francisco, CA: Jossey-Bass Publishers
Parkes, S., Zaka, P., & Davis, N. (2011). The first blended or hybrid online course in a New Zealand secondary school: A case study. *Computers in New Zealand Schools: Learning, teaching, technology, 23*(1), 1-30.
Passey, D., Rogers, C., Machell, J., McHugh, G., & Allaway, D. (2004). The motivational effect of ICT on pupils. London: Department of Education and Skills. Retrieved March 13, 2012, from http://www.canterbury.ac.uk/education/protected/spss/docs/motivational-effect-ict-brief.pdf
Pelto, G. H. (1978). *Anthropological research: The structure of inquiry*. Cambridge University Press.
Ponterotto, J. G. (2005). Qualitative research in counseling psychology: A primer on research paradigms and philosophy of science. *Journal of Counseling Psychology, 52*(2), 126.
Pratt, K., & Trewern, A. (2011). New Zealand students' perceptions of blended learning. In *Proceedings of Society for Information Technology & Teacher Education International Conference 2011*, Chesapeake, VA. Retrieved December 10, 2012, from http://editlib.org/p/36348
Prensky, M. (2001). Digital natives, digital immigrants Part 1. *On the horizon, 9*(5), 1-6.
Qin, Z., Johnson, D. W., & Johnson, R. T. (1995). Cooperative versus competitive efforts and

problem solving. *Review of Educational Research, 65*(2), 129-143.
Queiroz, V., & Mustaro, P. N. (2003). Roles and competencies of online teachers. *The Internet TESL Journal, 9*(7) 1-6.
Ritzer, G. (1975). Sociology: A multiple paradigm science. *The American Sociologist, 10*(3), 156-167.
Roberts, R. (2009). *TaraNet ePrincipal report.* Unpublished report.
Romero, C., & Ventura, S. (2007). Educational data mining: A survey from 1995 to 2005. *Expert Systems with Applications, 33*(1), 135-146.
Roschelle, J. (1992). Learning by collaborating: Convergent conceptual change. *The Journal of the Learning Sciences, 2*(3), 235-276.
Ross, J. A. (1996). The influence of computer communication skills on participation in a computer conferencing course. *Journal of Educational Computing Research, 15*(1), 37-52.
Rovai. (2002). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *The Internet and Higher Education, 5*(4), 319-332. doi: 10.1016/s1096-7516(02)00130-6
Rovai. (2004). A constructivist approach to online college learning. *The Internet and Higher Education, 7*(2), 79-93. doi: 10.1016/j.iheduc.2003.10.002
Rovai, A., Ponton, M., Wighting, M., & Baker, J. (2007). A comparative analysis of student motivation in traditional classroom and e-learning courses. *International Journal on E-learning, 6*(3), 413-432.
Rovai, A. P., & Jordan, H. M. (2004). Blended learning and sense of community: A comparative analysis with traditional and fully online graduate courses. [Article]. *International Review of Research in Open and Distance Learning, 5*(2), 1-12.
Rowe, K. (2003). *The importance of teacher quality as a key determinant of students' experiences and outcomes of schooling.* Background paper to keynote address presented at the 2003 ACER Research Conference, Melbourne, 19-21 October 2003. Retrieved December 12, 2012 from http://www.acer.edu.au/research/programs/learningprocess.html.
Rowe, K. J., & Rowe, K. S. (2002). *What matters most: Evidence-based findings of key factors affecting the educational experiences and outcomes for girls and boys throughout their primary and secondary schooling.* Invited supplementary submission to House of Representatives Standing Committee on Education and Training: *Inquiry Into the Education of Boys* (MIMEO). Melbourne, VIC: Australian Council for Educational Research, and Department of General Paediatrics, Royal Children's Hospital. Retrieved December 12, 2012 from http://www.acer.edu.au/research/programs/learningprocess.html.
Sánchez, M. (2012). *Concepts from mathematics education research as a trigger for mathematics teachers' reflections.* Retrieved June 7, 2012, from http://www.cerme7.univ.rzeszow.pl/WG/17a/CERME7_WG17A_Sanchez.pdf
Sanders, W. L., & Rivers, J. C. (1996). *Cumulative and residual effects of teachers on future student academic achievement.* Research Progress Report. Knoxville: University of Tennessee Value-Added Research and Assessment Center.
Sarason, S.B. (1974). *The psychological sense of community: Prospects for a community psychology*. San Francisco: Jossey-Bass.
Sax, L. (2006). Six degrees of separation: What teachers need to know about the emerging science of sex differences. *Educational Horizons, 84*(3), 190-200.
School A, (2012). [Year 11 Physical Education Achievement record]. Unpublished raw data.
Schrum, L., & Hong, S. (2002). Dimensions and strategies for online success: Voices from experienced educators. *Journal of Asynchronous Learning Networks, 6*(1), 57-67.
Selwyn, N. (2004). Reconsidering political and popular understandings of the digital divide. *New Media & Society, 6*(3), 341-362.
Shaikh, Z. A., & Khoja, S. A. (2012). Role of teacher in personal learning environments.*Digital Educator Review*, (21), 23-32.
Shulman, L. S., & Shulman, J. H. (2004). How and what teachers learn: A shifting perspective. *Journal of Curriculum Studies, 36*(2), 257-271.
Sieber, J. E., & Stanley, B. (1988). Ethical and professional dimensions of socially sensitive research. *American Psychologist, 43*(1), 49-55. doi: 10.1037/0003-066x.43.1.49
Singleton, H. W., & Session, C. L. (2011). Faculty concerns related to distance learning within nontraditional doctoral programs. *New Directions for Adult and Continuing Education, 2011*(129), 31-41. doi: 10.1002/ace.398

Sivan, E. (1986). Motivation in social constructivist theory. *Educational Psychologist, 21*(3), 209-233.
Smith, M. K. (1996). 'Action research', *the encyclopedia of informal education*. Retrieved April 18, 2012, from www.infed.org/research/b-actres.htm.
Snart, J. A. (2010). *Hybrid learning: the perils and promise of blending online and face-to-face instruction in higher education*. Santa Barbara, CA: Praeger.
Snook, I. (2003). *The ethical teacher*. Palmerston North, New Zealand: Dunmore Press.
Somekh, B. (2008). Model of Action Research. Retrieved August 9, 2012 from http://dc379.4shared.com/doc/X8zPutyZ/preview.html
Stacey, E., & Rice, M. (2011). Evaluating an online learning environment. *Australian Journal of Educational Technology, 18*(3), 323-340.
Stewart, C., Bachman, C., & Babb, S. (2009). Replacing professor monologues with online dialogues: A constructivist approach to online course template design. *Journal of Online Learning and Teaching, 5(3)*, 511-521.
Sthapornnanon, N., Sakulbumrungsil, R., Theeraroungchaisri, A., & Watcharadamrongkun, S. (2009). Social constructivist learning environment in an online professional practice course. *American Journal of Pharmaceutical Education, 73*(1), 1-8.
Sullivan, L. E. (2009). *The Sage glossary of the social and behavioral sciences*. Thousand Oaks, CA: Sage Publications Inc.
Swan, K. (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education, 22*(2), 306-331. doi: 10.1080/0158791010220208
Thomas, A., & Stratton, G. (2006). What we are really doing with ICT in physical education: a national audit of equipment, use, teacher attitudes, support, and training. *British Journal of Educational Technology, 37*(4), 617-632.
Thomas, M. J. W. (2002). Learning within incoherent structures: The space of online discussion forums. *Journal of Computer Assisted Learning, 18*(3), 351-366.
Thornburg, R., & Hill, K. (2004). Using internet assessment tools for health and physical education instruction. *TechTrends, 48*(6), 53-55.
Tinker, R. (2001). E-learning quality: The concord model for learning from a distance. *NASSP Bulletin, 85*(628), 36-46.
Tolich, M., & Davidson, C. (1999). *Starting fieldwork: An introduction to qualitative research in New Zealand*. Melbourne, Australia: Oxford University Press.
Tomal, D. R. (2010). *Action research for educators*. Rowman & Littlefield.
Trochim, W. M. K., & Donnelly, J. P. (2001). *Research methods knowledge base* (Vol. 32). Mason, OH: Atomic Dog Publications.
Troha, F. J. (2002). Bulletproof instructional design: A model for blended learning. *USDLA Journal, 16*(5), 1-7.
Tyler-Smith, K. (2006). Early attrition among first time elearners: A review of factors that contribute to drop-out, withdrawal and non-completion rates of adult learners undertaking elearning programmes. *Journal of Online Learning and Teaching, 2*(2), 73-85.
Volery, T., & Lord, D. (2000). Critical success factors in online education. *The International Journal of Educational Management, 14*(5), 216-223.
Vonderwell, & Zachariah, S. (2005). Factors that influence participation in online learning. *Journal of Research on Technology in Education, 38*(2), 213-230.
Walsh, N. (2011) *Teaching year 11 physical education in a blended format. EDEM 628.* Unpublished manuscript.
Walter, M. (2009). Participatory action research. In Social Research Methods (Ed.), *Social Research Methods, 2nd ed* (Vol. 21). Melbourne, Victoria, Australia: Oxford University Press.
Wang, A., & Newlin, M. (2002). Predictors of performance in the virtual classroom: Identifying and helping at-risk cyber-students. *Technical Horizons in Education, 29*(10), 21-25.
Wang, A. Y., Newlin, M. H., & Tucker, T. L. (2001). A discourse analysis of online classroom chats: Predictors of cyber-student performance. *Teaching of Psychology, 28*(3), 222-226.
Wang, S. K., & Reeves, T. C. (2007). The effects of a web-based learning environment on student motivation in a high school earth science course. *Educational Technology Research and Development, 55*(2), 169-192.
Ward, J., & LaBranche, G. A. (2003). Blended learning: The convergence of e-learning and meetings. *Franchising World, 35*(4), 22-23.

Waters-Adams. (2006). Action Research in Education. *Faculty of Education, University of Plymouth.* Retrieved March 9, 2012, from http://www.edu.plymouth.ac.uk/resined/actionresearch/arhome.htm#top

Webster, J., & Hackley, P. (1997). Teaching effectiveness in technology-mediated distance learning. *Academy of Management Journal*, 40(6), 1282-1309.

Wells, G. (2009). Dialogic inquiry as collaborative action research. In S. Noffke & B. Somekh (Eds.), *The Sage Handbook of Educational Action Research*. Los Angeles, C.A.: Sage.

Wendler, D., & Miller, F. G. (2004). Deception in the pursuit of science. *Archives of Internal Medicine, 164*(6), 597-600.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. New York, N.Y.: Cambridge University Press.

Wentling, T., Park, J., & Peiper, C. (2007). Learning gains associated with annotation and communication software designed for large undergraduate classes. *Journal of Computer Assisted Learning, 23*(1), 36-46.

West, P. (2001). *Report on best practice in boys' education*. Sydney, N.S.W.: University of Western Sydney, Men's Health Information & Research Centre, Research Group on Men & Families.

Whitehead, J., & McNiff, J. (2006). *Action research: Living theory*: London: Sage Publications Ltd.

Williams, N. A., Bland, W., & Christie, G. (2008). Improving student achievement and satisfaction by adopting a blended learning approach to inorganic chemistry. *Chemistry Education Research and Practice, 9*(1), 43-50.

Wilson, G., & Stacey, E. (2011). Online interaction impacts on learning: Teaching the teachers to teach online. *Australasian Journal of Educational Technology, 20*(1), 33-48.

Wright, N. (2010). *e-Learning and implications for New Zealand schools: a literature review*. Wilf Malcolm Institute of Educational Research, University of Waikato, New Zealand: Ministry of Education.

Yen, J. C., & Lee, C. Y. (2011). Exploring problem solving patterns and their impact on learning achievement in a blended learning environment. *Computers & Education, 56*(1), 138-145.

York, C. S., Yang, D., & Dark, M. (2007). Transitioning from face-to-face to online instruction: How to increase presence and cognitive/social interaction in an online information security risk assessment class. *International Journal of Information and Communication Technology Education (IJICTE), 3*(2), 41-50.

Younger, M., Warrington, M. J., & McLellan, R. (2005). *Raising boys' achievement in secondary schools*. Maidenhead, Berkshire, United Kingdom: Open University Press.

Yukselturk, E., & Bulut, S. (2009). Gender differences in self-regulated online learning environment. [Article]. *Journal of Educational Technology & Society, 12*(3), 12-22.

Zaka, P. (2012). *Blended teaching and learning in a New Zealand rural secondary school: Using an ecological framework.* Unpublished Master's thesis, University of Canterbury, Christchurch.

Zeni, J. (2009). Ethics and the 'Personal' in Action Research. In S. Noffke & B. Somekh (Eds.), *The Sage handbook of educational action research.* Los Angeles, CA: Sage.

Appendices

Appendix 1: Action research for educators

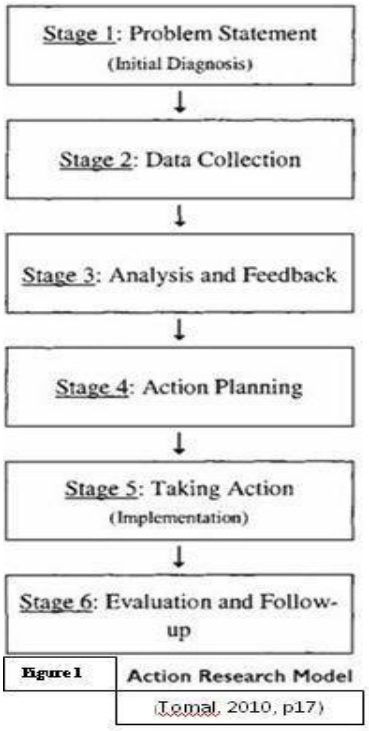


Figure 1: Tomal, D. (2010). Action research for educators. (Second ed.). Maryland: Rowman and Littlefield Education.Retrieved from http://reader.eblib.com.au.ezproxy.canterbury.ac.nz/(S(achpllirkekg25jl3pdtdm2w))/Reader.aspx?p=500942&o=150&u=ohZEiIYDZ7E%3d&t=1316485814&h=8547DDDFE562C0B4BDB08C8436F4A79A142AE055&s=4823857&ut=460&pg=1&r=img&c=-1&pat=n#

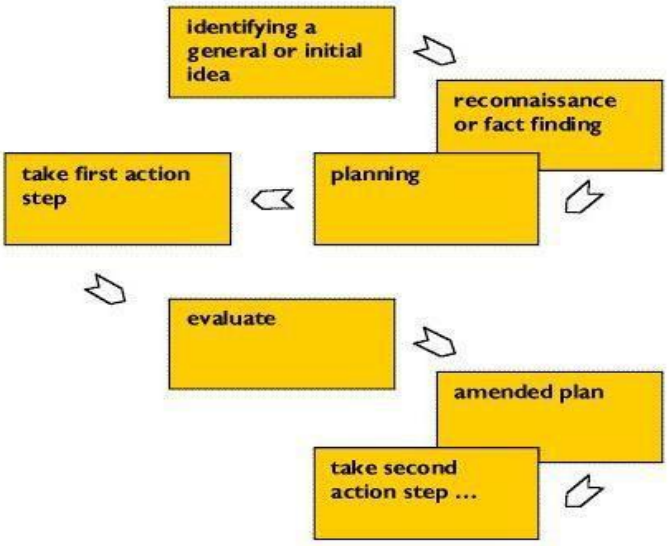


Figure 2 : Action research model 2 (Smith 1996, para 6) Smith, M. K. (1996). 'Action research', the encyclopedia of informal education, from www.infed.org/research/b-actres.htm.

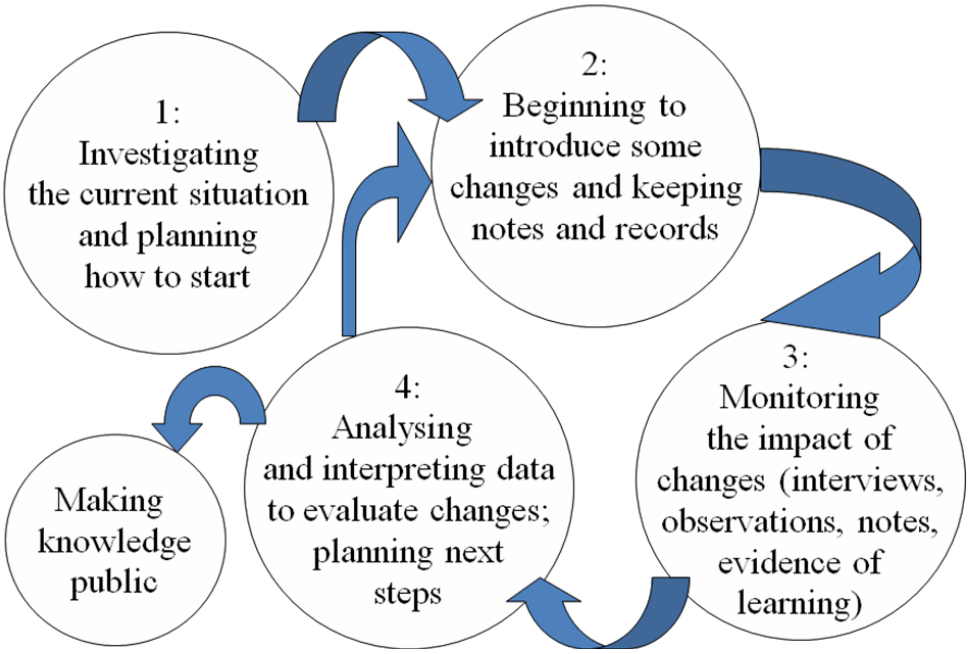


Figure 3: Adapted from Somekh's (2008) Model of Action Research. Retrieved August 9, 2012 from http://dc379.4shared.com/doc/X8zPutyZ/preview.html

Appendix 2: Board of Trustees information letter

College of Education
Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

18th of April 2012

Project title: Boys' and blended learning: Online participation and achievement.

Dear Members of the Board of Trustees,

As part of my Masters of Education study this year I am planning to conduct a research activity into participation and achievement for boys when learning in a blended format (face-to-face and online). I would like to conduct the research at XX with XX's Year 11 Physical Education class in Term Two. I would like to invite all students from his class to volunteer to complete a written questionnaire, and to agree to the analysis of their online participation. I would also like to invite approximately six students to complete a verbal recorded interview and I plan to analyse their online participation in more depth. I will be responsible for designing, implementing and teaching the online part of the course.

Involvement in this study is voluntary and all students and parents of students will receive detailed information about the study and individual and parental consent will be sought. (I have attached copies of these documents for your information) This study presents no real risk to the participants as the main focus is on improving outcomes for all boys in the class. All data obtained from the study will be kept in the strictest confidence and all participants will remain anonymous. The school and the students will not be identified in any way in publication of the findings.

As the researcher, I will be the only one who knows student's responses to the questionnaire and interview, and the recorded interview will be conducted in a private classroom. Boys' participation in the study is voluntary and they may choose to withdraw at any time without penalty. In no way will student grade or learning opportunities be affected if they choose to participate or not. All data gained from the study will be treated in strictest confidence and when the results are to be published, the school and all participants in the study will be given a code name in order to remain anonymous.

All data will be kept by me and will not be given to any other researcher or agency. XXXX will have no access to the raw data obtained from this study. Reasonable precautions will be taken to protect privacy of data transmitted through the Internet. As required by the University of Canterbury's research policy, at the completion of the project all information collected will be retained in secure storage for five years, after which it will be destroyed.

The results of the study may be submitted for publication to national or international journals or presented at educational conferences. You may at any time ask for additional information or results from the study.

If you would like more information or have any questions, concerns or comments about the research, you can contact me at the email or phone number above, or the University of Canterbury's Human ethics Committee, at human-ethics@canterbury.ac.nz.

The only resources I require are the use of a computer room in the classes' usual timetabled period.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee, and any complaints should be addressed to The Chair, Educational Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

Thank you

Appendix 3: Board of Trustees consent form

College of Education
Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

School Consent Form

Project title: Boys' and blended learning: Online participation and achievement.

(Please tick each box)

☐ I have read the information sheet and attached documents and I fully understand the proposed project.

☐ I understand that boys' participation in this research study is voluntary and their learning opportunities will be the same regardless of whether they choose to participate in the research or not.

☐ I understand that all information collected will only be accessed by the researcher and that it will be kept confidential and secure.

☐ I understand that neither individuals nor the school will be identified in any presentations or publications that draw on this research.

☐ I understand that boys may choose to withdraw from their voluntary participation in the research at any time without penalty.

☐ I understand that I will receive a report on the findings of the study.

☐ I understand that I can get more information about this project from Mr Nathan Walsh, and I can contact the University of Canterbury Ethics Committee if I have any complaints about the research.

☐ I understand the individual interviews at the conclusion of the study will be audio recorded. I understand that boys' contributions and activity in the online course will be analysed.

☐ I have had all questions answered to my satisfaction and I provide my approval for this research to be conducted.

Headmaster _____

Signed: _____

Date: _____

Please return this consent form by placing it in the envelope provided and passing to XXXX in the school office.

Appendix 4 Head Master information letter

College of Education
Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

18th of April 2012

Project title: Boys' and blended learning: Online participation and achievement.

Dear Sir,

As part of my Master's of Education study this year I am planning to conduct a research activity into participation and achievement for boys when learning in a blended format (face-to-face and online). I would like to conduct the research at XX School with XXs Year 11 Physical Education class in Term Two. I would like to invite all students from his class to volunteer to complete a written questionnaire, and to agree to the analysis of their online participation. I would also like to invite approximately six students to complete a verbal recorded interview and I plan to analyse their online participation in more depth. I will be responsible for designing, implementing and teaching the online part of the course.

Involvement in this study is voluntary and all students and parents of students will receive detailed information about the study and individual and parental consent will be sought. (I have attached copies of these documents for your information) This study presents no real risk to the participants as the main focus is on improving outcomes for all boys in the class. All data obtained from the study will be kept in the strictest confidence and all participants will remain anonymous. The school and the students will not be identified in any way in publication of the findings.

As the researcher, I will be the only one who knows student's responses to the questionnaire and interview, and the recorded interview will be conducted in a private classroom. Complete anonymity cannot be guaranteed during the online learning aspect of the course. Student responses to discussion posts will be seen by all class members as sharing is an important method of learning in an online course. At the conclusion of the research all discussion post responses will be closed from class members' view. During the analysis and reporting of results, code names will be used for all participants. The researcher will be the only person with the matched names and code names. Mr XX will have no access to the raw data obtained from this study. Boys' participation in the study is voluntary and they may choose to withdraw at any time without penalty. In no way will student grade or learning opportunities be affected if they choose to participate or not. All data gained from the study will be treated in strictest confidence and when the results are to be published, the school and all participants in the study will be given a code name in order to remain anonymous.

All data will be kept by me and will not be given to any other researcher or agency. Reasonable precautions will be taken to protect privacy of data transmitted through the Internet. As required by the University of Canterbury's research policy, at the completion of the project all information collected will be retained in secure storage for five years, after which it will be destroyed.

The results of the study may be submitted for publication to national or international journals or presented at educational conferences. You may at any time ask for additional information or results from the study.

If you would like more information or have any questions, concerns or comments about the research, you can contact me at the email or phone number above, or the University of Canterbury's Human ethics Committee, at human-ethics@canterbury.ac.nz.

The only resources I require are the use of a computer room in the classes' usual timetabled period – which I can book with XX.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee, and any complaints should be addressed to The Chair, Educational Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

Thank you

Nathan Walsh
College of Education
School of Literacies and Arts in Education

Appendix 5: Head Master consent form

College of Education
Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

Board of Trustees Consent Form

Project title: Boys' and blended learning: Online participation and achievement

(Please tick each box)

☐ I have read the information sheet and attached documents and I fully understand the proposed project.

☐ I understand that boys' participation in this research study is voluntary and their learning opportunities will be the same regardless of whether they choose to participate in the research or not.

☐ I understand that all information collected will only be accessed by the researcher and that it will be kept confidential and secure.

☐ I understand that neither individuals nor the school will be identified in any presentations or publications that draw on this research.

☐ I understand that boys may choose to withdraw from their voluntary participation in the research at any time without penalty.

☐ I understand that I will receive a report on the findings of the study.

☐ I understand that I can get more information about this project from Mr Nathan Walsh, and I can contact the University of Canterbury Ethics Committee if I have any complaints about the research.

☐ I understand the individual interviews at the conclusion of the study will be audio recorded. I understand that boys' contributions and activity in the online course will be analysed.

☐ I have had all questions answered to my satisfaction and I provide my approval for this research to be conducted.

Board of Trustees Chair: _____

Signed: _____

Date: _____

Please return this consent form by placing it in the envelope provided and passing to XX in the school office.

Appendix 6: Student Information sheet

College of Education
School of Literacies and Arts in Education
Tel: +64 3 343 9606, Fax: + 64 343 7790

Information Sheet for students

Project title: Boys' and blended learning: Online participation and achievement.

Dear members of Mr XX Year 11 PE class:

My name is Mr Walsh and I am a teacher at XX School but this year I am carrying out research at Canterbury University looking at boys' education and blended learning (face-to-face and online learning). I would like to invite you to be part of a six-week research activity that investigates factors that affect participation and achievement when learning online.

This term you will be studying material related to Physical Education Achievement Standard 1.2 (Demonstrate understanding of the function of the body as it relates to the performance of physical activity) The material will be taught in a mixture of normal classroom sessions with Mr Watson and will include one session per week in the computer room where you will be working independently with online material.

I would like to invite you to assist me with this project by agreeing to:

- Complete a pre-course written questionnaire about blended learning (which will take approximately 10 minutes to complete).
- The analysis of your online activity.

At the end of the six-week course, and after your internal assessment has been completed, I would like to:

- Invite six boys to participate in an individual interview. This short interview will be recorded and conducted in a classroom and should take approximately 15 minutes.

As the researcher, I will be the only one who knows your responses to the questionnaire and interview, and the recorded interview will be conducted in a private classroom. Complete anonymity cannot be guaranteed during the online learning aspect of the course. Student responses to discussion posts will be seen by all class members as sharing is an important method of learning in an online course. At the conclusion of the research all discussion post responses will be closed from class members' view. During the analysis and reporting of results, code names will be used for all participants. The researcher will be the only person with the matched names and code names. Mr Watson will have no access to the raw data obtained from this study. Your participation in the study is voluntary and you may choose to withdraw any time without penalty. In no way will your grade or report be affected if you chose to or chose not to participate. All data gained from the study will be treated in strictest confidence and code names will be used for the school and all participants in the study throughout the study and in any publications.

All data will be kept by me and will not be given to anyone else. As required by the University of Canterbury's research policy, at the completion of the project all information collected will be retained in secure storage for five years, after which it will be destroyed.

The results of the study may be submitted for publication to national or international journals or presented at educational conferences. You may at any time ask for additional information or results from the study by speaking with me directly or emailing me at the address below. If you would like more information or have any questions, concerns or comments about the research, you can contact me at the email or phone number above.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee, and any complaints should be addressed to The Chair, Educational Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you are happy to take part please sign the consent form and return it to me. Please retain this information sheet.

Thank you
Mr N Walsh
walshn@staff.cbhs.school.nz

Appendix 7: Student consent form

College of Education
Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Student Consent Form – please return with your parental consent form

Project title: Boys' and blended learning: Online participation and achievement.

(Please tick each box)

☐ I have read the information sheet and fully understand what will be required of me if I participate in this project.

☐ I understand that participation in this study is voluntary and that my learning opportunities and grade will not be affected if I chose to participate or not.

☐ I have read the information letter and understand that all information collected will only be accessed by the researcher and that it will be kept confidential and secure.

☐ I understand that neither I, nor my school, will be identified in any presentations or publications that draw on this research.

☐ I understand that my participation is voluntary and I may choose to withdraw at any time without penalty.

☐ I understand that I can receive a report on the findings of the study. I have written my email address below if I should like a copy.

☐ I understand that I can get more information about this project from Mr Walsh, and I can contact the University of Canterbury Ethics Committee if I have any complaints about the research.

☐ I understand the individual interviews at the conclusion of the study will be audio recorded. I understand that my contributions and activity on the online course will be analysed.

☐ I have had all questions answered to my satisfaction and I agree to participate in the study and my parents have also given consent on their consent form.

Full name of student: _____

Class Teacher: _____Mr XX/Mr Walsh_____

Signed (student): _____

Date: _____

Optional email address for report: _____

Please return this consent form by bringing it to T3 tomorrow at interval.

Appendix 8: Parent information letter

College of Education
Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

Information letter for Parents/caregivers

Project title: Boys' and blended learning: Online participation and achievement.

Dear Parents/Guardians,

My name is Nathan Walsh and I am a teacher at Christchurch Boys' High School. This year I am on study leave completing my Masters in Education at Canterbury University. I am researching how a blend of regular classroom teaching and online learning can support and enhance boys' education. I am working with Mr Watson's Year 11 Physical Education class to plan and teach a short online component and I will be investigating the effects on boys' participation and achievement when learning online.

During Term Two, Mr Watson's class will be working through the content of a theory-based Physical Education Achievement Standard (Demonstrate understanding of the function of the body as it relates to the performance of physical activity) in preparation for the internal assessment at the end of the term. This year the content will be taught using a mixture of regular classroom sessions and one online session per week, where the boys will work independently in a computer lab under the supervision of Mr Watson.

As part of my research I would like to invite all students in the class:

- To complete a pre course written questionnaire about blended learning, participation and achievement (this should take approximately 10 minutes).
- To agree to analysis of their online activity for research purposes.

At the end of the six week course, and after the assessment has been completed, I would like to

- Invite six boys to participate in an individual interview which will be recorded.

Involvement in the research aspect of this element of the course is completely voluntary and will in no way affect your son's learning opportunities or grade should he chose to participate or not. If your son does choose to participate, he can withdraw from the study at any time without penalty. If your son chooses to withdraw, I will do my best to remove any information relating to him, provided this is practically achievable.

As the researcher, I will be the only one who knows your son's responses to the questionnaire and interview, and the recorded interview will be conducted privately in a classroom. Your son's participation in the study is voluntary and he may choose to withdraw any time. In no way will his grade or report be affected if he chooses to or chose not to participate. All data gained from the study will be treated in strictest confidence and when the results are published, the school and all participants in the study will be given a code name in order to remain anonymous.

All data will be kept by me and will not be given to any other research agency. As required by the University of Canterbury's research policy, at the completion of the project all information collected will be retained in secure storage for five years, after which it will be destroyed.

The results of the study may be submitted for publication to national or international journals or presented at educational conferences. You may at any time ask for additional information or results from the study. If you would like more information or have any questions, concerns or comments about the research, you can contact me at the email or phone number above.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee, and any complaints should be addressed to The Chair, Educational Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you are happy for your son to participate in this study, please sign the student consent form, place it in the enclosed envelope, and return it with your son to me at school tomorrow. Please retain this information sheet.

Thank You

Appendix 9: Parent consent form

College of Education

Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Parent Consent Form – Please return with your son's student consent form

Project title: Boys' and blended learning: Online participation and achievement.

(Please tick each box)

☐ I have read the information sheet and fully understand what will be required of my son if he participates in this project.

☐ I understand that his participation in this research study is voluntary and in no way will my son's learning opportunities or grade be affected via participation or otherwise.

☐ I have read the information letter and understand that all information collected will only be accessed by the researcher and that it will be kept confidential and secure.

☐ I understand that neither my son, nor his school, will be identified in any presentations or publications that draw on this research.

☐ I understand that his participation is voluntary and he may choose to withdraw at any time.

☐ I understand that I can receive a report on the findings of the study. I have written my email address below if I should like a copy.

☐ I understand that I can get more information about this project from Mr Nathan Walsh, and I can contact the University of Canterbury Ethics Committee if I have any complaints about the research.

☐ I understand the individual interviews at the conclusion of the study will be audio recorded. I understand that my son's contributions and activity on the online course will be analysed.

☐ I have had all questions answered to my satisfaction and I agree for my son to participate in the study.

Full name of student: _____

Class Teacher: _____Mr XXXX/Mr XXXX_____

Signed (parent): _____

Date: _____

Optional email address for report: _____

Please return this consent form with your son to give to Mr XXXX or Mr XXXX tomorrow.

Appendix 10: Staff information letter

College of Education
Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

Information letter for Parents/caregivers

Project title: Boys' and blended learning: Online participation and achievement.

Dear Parents/Guardians,

My name is Nathan Walsh and I am a teacher at Christchurch Boys' High School. This year I am on study leave completing my Masters in Education at Canterbury University. I am researching how a blend of regular classroom teaching and online learning can support and enhance boys' education. I am working with Mr Watson's Year 11 Physical Education class to plan and teach a short online component and I will be investigating the effects on boys' participation and achievement when learning online.

During Term Two, Mr Watson's class will be working through the content of a theory-based Physical Education Achievement Standard (Demonstrate understanding of the function of the body as it relates to the performance of physical activity) in preparation for the internal assessment at the end of the term. This year the content will be taught using a mixture of regular classroom sessions and one online session per week, where the boys will work independently in a computer lab under the supervision of Mr Watson.

As part of my research I would like to invite all students in the class:

- To complete a pre course written questionnaire about blended learning, participation and achievement (this should take approximately 10 minutes).
- To agree to analysis of their online activity for research purposes.

At the end of the six week course, and after the assessment has been completed, I would like to

- Invite six boys to participate in an individual interview which will be recorded.

Involvement in the research aspect of this element of the course is completely voluntary and will in no way affect your son's learning opportunities or grade should he chose to participate or not. If your son does choose to participate, he can withdraw from the study at any time without penalty. If your son chooses to withdraw, I will do my best to remove any information relating to him, provided this is practically achievable.

As the researcher, I will be the only one who knows your son's responses to the questionnaire and interview, and the recorded interview will be conducted privately in a classroom. Your son's participation in the study is voluntary and he may choose to withdraw any time. In no way will his grade or report be affected if he chooses to or chose not to participate. All data gained from the study will be treated in strictest confidence and when the results are published, the school and all participants in the study will be given a code name in order to remain anonymous.

All data will be kept by me and will not be given to any other research agency. As required by the University of Canterbury's research policy, at the completion of the project all information collected will be retained in secure storage for five years, after which it will be destroyed.

The results of the study may be submitted for publication to national or international journals or presented at educational conferences. You may at any time ask for additional information or results from the study. If you would like more information or have any questions, concerns or comments about the research, you can contact me at the email or phone number above.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee, and any complaints should be addressed to The Chair, Educational Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you are happy for your son to participate in this study, please sign the student consent form, place it in the enclosed envelope, and return it with your son to me at school tomorrow. Please retain this information sheet.

Thank You

Nathan Walsh

Appendix 10: Staff information letter

College of Education
School of Literacies and Arts in Education
Tel: +64 3 343 9606, Fax: + 64 343 7790

Information Sheet for staff

Project title: Boys' and blended learning: Online participation and achievement.

Dear XX:

As part of my Masters of Education study this year I am planning to conduct a research activity into participation and achievement for boys when learning in a blended format (face-to-face and online). In order to reflect on the progress of the students in the blended learning course, I would like to conduct informal discussions with you as part of normal professional conversations.

I would like to invite you to assist me with this project by agreeing to:

- Have weekly discussions with me to reflect on the progress of the students in the blended learning course (which will take approximately 10 minutes to complete).

All discussions will be conducted in a private classroom or office and as the researcher; I will be the only one who knows your responses to the discussions. Complete anonymity and confidentiality will be guaranteed. Your participation in the study is voluntary and you may choose to withdraw any time without penalty. In no way will your teaching be affected if you chose to or chose not to participate. All data gained from the study will be treated in strictest confidence and code names will be used for the school, staff and all participants in the study throughout the study and in any publications.

All data will be kept by me and will not be given to anyone else. As required by the University of Canterbury's research policy, at the completion of the project all information collected will be retained in secure storage for five years, after which it will be destroyed.

The results of the study may be submitted for publication to national or international journals or presented at educational conferences. You may at any time ask for additional information or results from the study by speaking with me directly or emailing me at the address below. If you would like more information or have any questions, concerns or comments about the research, you can contact me at the email or phone number above.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee, and any complaints should be addressed to The Chair, Educational Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you are happy to take part please sign the consent form and return it to Helen Haggitt in the school office. Please retain this information sheet.

Thank you

Mr N Walsh

walshn@staff.XXXX.school.nz

Appendix 11: Staff consent form

College of Education

Nathan Walsh
University of Canterbury
School of Literacies and Arts in Education
Dovedale Avenue
Tel: +64 21 118 XXXX
Email: walshn@staff.XXXX.school.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Staff Consent Form

Project title: Boys' and blended learning: Online participation and achievement.

(Please tick each box)

☐ I have read the information sheet and fully understand what will be required of me if I participate in this project.

☐ I understand that participation in this study is voluntary and that my teaching will not be affected if I chose or chose not to participate.

☐ I have read the information letter and understand that all information collected will only be accessed by the researcher and that it will be kept confidential and secure.

☐ I understand that neither I, nor my school, will be identified in any presentations or publications that draw on this research.

☐ I understand that my participation is voluntary and I may choose to withdraw at any time without penalty.

☐ I understand that I can receive a report on the findings of the study. I have written my email address below if I should like a copy.

☐ I understand that I can get more information about this project from Nathan Walsh, and I can contact the University of Canterbury Ethics Committee if I have any complaints about the research.

☐ I understand that I will be invited to conduct weekly discussions on the progress and engagement of the students undertaking the online learning course.

☐ I have had all questions answered to my satisfaction and I agree to participate in the study.

Full name of staff member: _____

Signed (teacher): _____

Date: _____

Optional email address for report: _____

Please return this consent form by handing it to XX in the school office.

Appendix 12: Pre-course questionnaire

Name _____

1. Circle the number which best shows your level of expertise with using computers.

Beginner		Intermediate		Advanced
1	2	3	4	5

2. Do you like using computers? Yes / No

Why/Why not?

2. Have you ever been a participant in an online or blended learning course before? Yes / No

If yes, please describe briefly

3. Are you looking forward to completing a course online? Yes / No / Unsure

Why/Why Not?

4. Please identify any factors which may affect your participation in this online learning course:

5. What final grade do you think you will achieve for this theory Achievement Standard 1.2 assessment?

Not Achieved Achieved Merit Excellence

6. Please identify any other factors which may affect your final grade for this Achievement Standard 1.2.

Appendix 13: Pre-course questionnaire trends and consistencies

Average level of expertise using computers amongst the class was 3.2/5. (1 beginner – 5 Advanced)

All 16 students like using computers.

15/16 students have never learned in an online or blended format before.

5 students are looking forward to learning via online lessons, 11 are unsure.

The three most commonly identified any factors which may affect participation in this online learning course were: Lack of computer skill, Not enjoying it, not understanding it

Student expectations of grade: Excellence: 3, Merit: 10, Achieved: 2 Unsure: 1

No other factors were identified which may affect final grades for the Achievement Standard assessment.

Appendix 14: Excerpt from field notes

Monday 23rd of April2012. 11PE54 in Room 10.

Lesson One.
Introduction to the term's work. Class room based learning of skeletal system and introduction to my study/consents etc.
16 students present - absent [redacted]

Students seemed rather sleepy in class (afternoon, first day back) but general positive feeling to participate in my study. Felt introduction and discussion of study was very rushed. No questions from the boys about the study or participation. All boys seemed interested and keen to participate, no problems with requireme-nts of interviews and analysis of online activity.
16 information sheets and consent forms for parents and students handed out. 16/16 student consent forms in and two parent consent forms in from hostel boys.

Pop quiz study large range of results as expected. 5-11/15. Good comments from boys about bones, muscles etc
P. W.'s teaching speed may be quicker than mine-covered a bit more than I thought he would today. Will need to ensure that I check with him first how much he will get through each lesson.
Parental consent forms to be collected tomorrow at interval.

Monday 23rd of April 2012. course creation at home.
Although I've set up and run this course 3X now, still takes a huge amount of time. Luckily I saved last years course!I was immediately reminded about the amount of set up time and preparation of an online course. Took 3 hours to get basic format sorted and activities for lesson one ready to go. Created quiz,

Appendix 15: Post-course semi-structured individual interview questions

1. Did you enjoy the online learning course? Why / why not?

2. What part of the online lessons did you feel was most helpful to your learning?

3. How would you rate your overall level of participation in the online learning part of the course? Why?

4. Did you look back through the course to check what others had written/check your quiz marking etc?

5. Do you think you were more on task/participate 'better' in the classroom lessons, or the online lessons? Why?

6. Did you use the online learning site at all outside of class time? Why/Why not?

7. Do you think you could have done this without a teacher present or even from home? / Did you feel it was important to have me and Mr Watson in class for the online learning sessions to help and support your learning?

8. Do you think you performed better or worse because of the online lessons, than you would have if you were taught solely face-to-face?

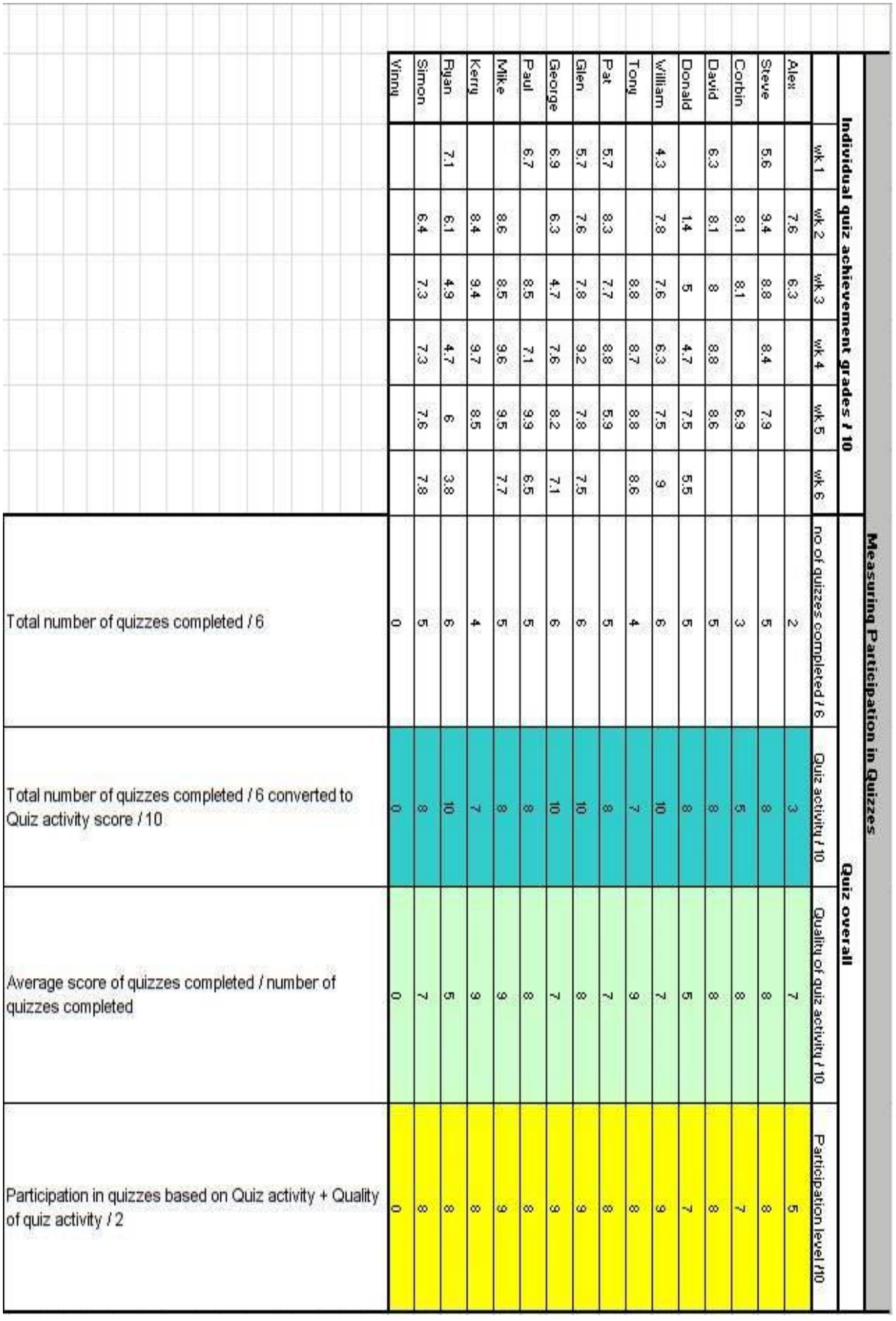
9. If you had learnt entirely face-to-face in the classroom (no online learning) do you think you would have achieved a higher or lower grade?

10. Based only on how you participated in the classroom and online lessons is the final grade that you achieved, what you expected? Why?

11. Explain as many factors as you can which influenced your participation in the online learning course.

12. Explain as many factors as you can which influenced your grade in the overall NCEA achievement Standard test.

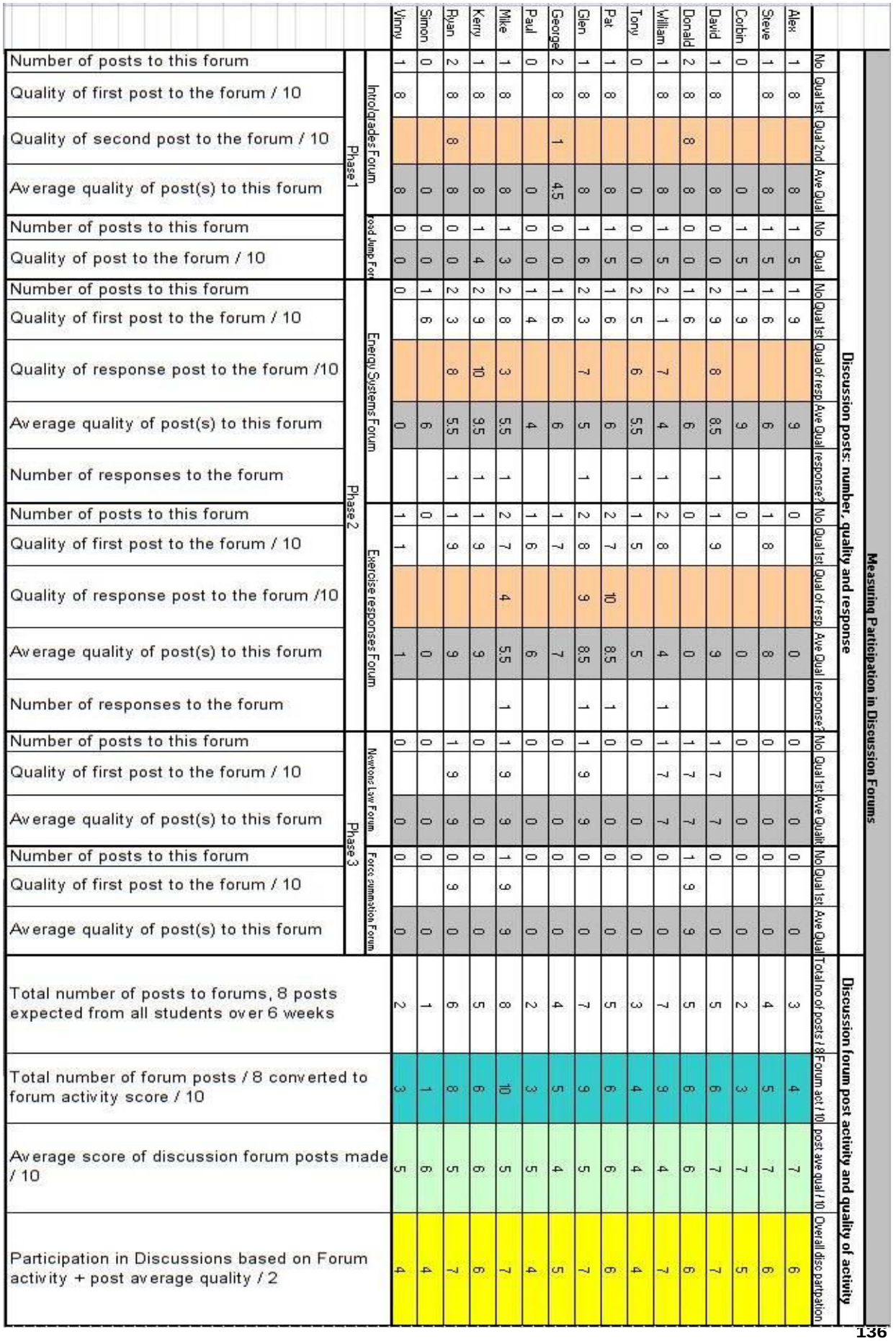
Appendix 16: Quiz Participation



Measuring Participation in Quizzes	Individual quiz achievement grades / 10						Quiz overall		
	wk 1	wk 2	wk 3	wk 4	wk 5	wk 6	no of quizzes completed / 6	Quiz activity / 10	Quality of quiz activity / 10	Participation level /10
Alex		7.6	6.3				2	3	7	5
Steve	5.6	9.4	8.8	8.4	7.9		5	8	8	8
Corbin		8.1	8.1		6.9		3	5	8	7
David	6.3	8.1	8	8.8	8.6		5	8	8	8
Donald		1.4	5	4.7	7.5	5.5	5	8	5	7
William	4.3	7.8	7.6	6.3	7.5	9	6	10	7	9
Tony			8.8	8.7	8.8	8.6	4	7	9	8
Pat	5.7	8.3	7.7	8.8	5.9		5	8	7	8
Glen	5.7	7.6	7.8	9.2	7.8	7.5	6	10	8	9
George	6.9	6.3	4.7	7.6	8.2	7.1	6	10	7	9
Paul	6.7		8.5	7.1	9.9	6.5	5	8	8	8
Mike		8.6	8.5	9.6	9.5	7.7	5	8	9	9
Kerry		8.4	9.4	9.7	8.5		4	7	9	8
Ryan	7.1	6.1	4.9	4.7	6	3.8	6	10	5	8
Simon		6.4	7.3	7.3	7.6	7.8	5	8	7	8
Vinny							0	0	0	0

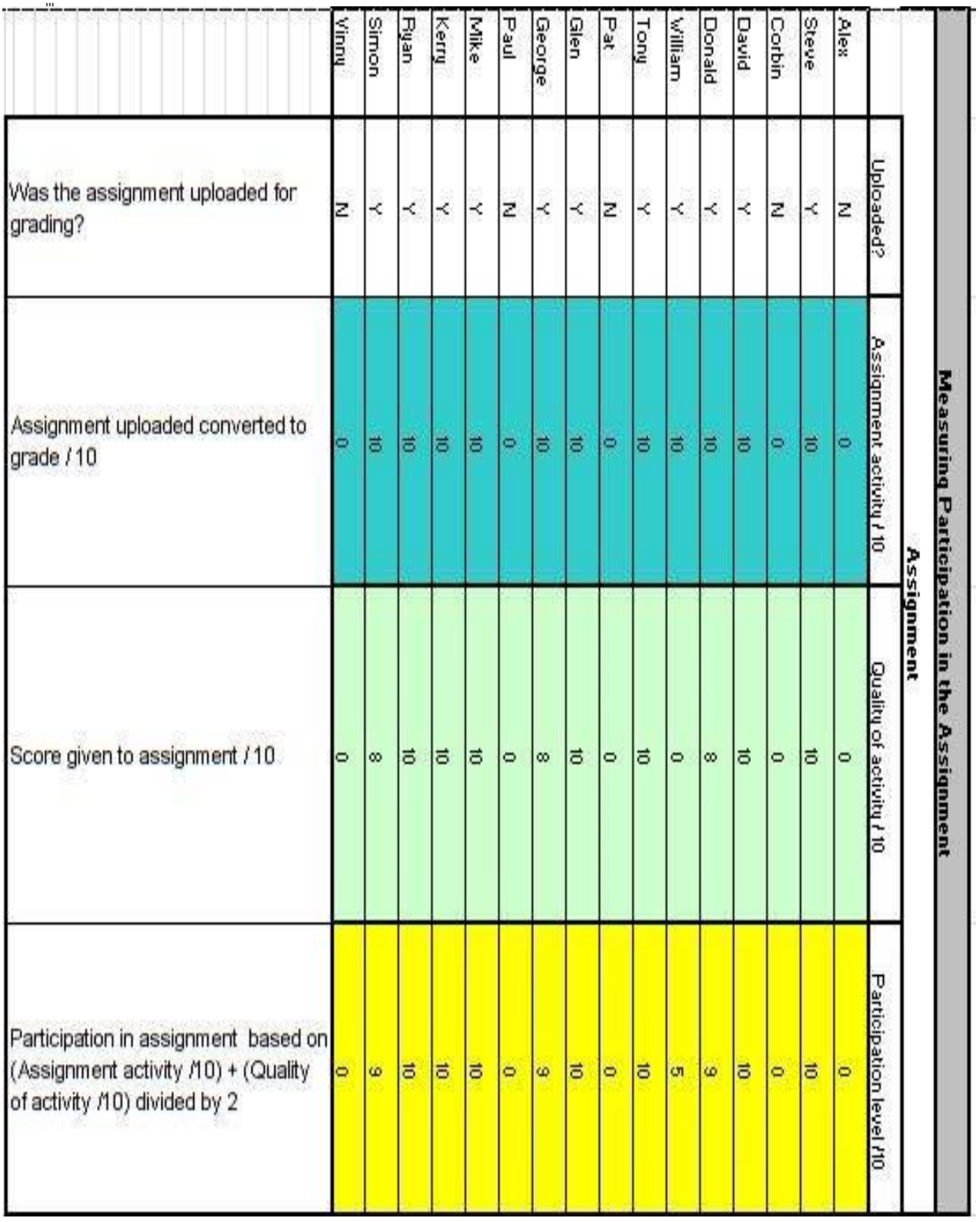
Total number of quizzes completed / 6	
Total number of quizzes completed / 6 converted to Quiz activity score / 10	
Average score of quizzes completed / number of quizzes completed	
Participation in quizzes based on Quiz activity + Quality of quiz activity / 2	

Appendix 17: Discussion Participation



| Measuring Participation in Discussion Forums | | |

Appendix 18: Assignment participation



Measuring Participation in the Assignment				
	Assignment			
	Uploaded?	Assignment activity / 10	Quality of activity / 10	Participation level /10
Alex	N	0	0	0
Steve	Y	10	10	10
Corbin	N	0	0	0
David	Y	10	10	10
Donald	Y	10	8	9
William	Y	10	0	5
Tony	Y	10	10	10
Pat	N	0	0	0
Glen	Y	10	10	10
George	Y	10	8	9
Paul	N	0	0	0
Mike	Y	10	10	10
Kerry	Y	10	10	10
Ryan	Y	10	10	10
Simon	Y	10	8	9
Vinny	N	0	0	0
Was the assignment uploaded for grading?		Assignment uploaded converted to grade / 10	Score given to assignment / 10	Participation in assignment based on (Assignment activity /10) + (Quality of activity /10) divided by 2

Appendix 19: LMS Activity Participation

Measuring Participation activity in the LMS		
Total hits activity on Moodle		
	Moodle activity	Participation level /10
Alex	167	4
Steve	232	7
Corbin	147	3
David	292	10
Donald	198	5
William	239	7
Tony	181	5
Pat	290	10
Glen	276	9
George	238	7
Paul	184	5
Mike	255	8
Kerry	200	5
Ryan	326	10
Simon	205	6
Vinny	109	1

Moodle participation based on total amount of activity

10 = 281 or more activity
9 = 261 - 280 activity
8 = 241 - 260 hits
7 = 221 - 240 hits
6 = 201 - 220 hits
5 = 181 - 200 hits
4 = 161 - 180 hits
3 = 141 - 160 hits
2 = 121 - 140 hits
1 = 120 hits or less

Appendix 20: Total online module participation

Total overall module Participation	
	Total overall participation /10
Alex	4
Steve	8
Corbin	4
David	9
Donald	7
William	7
Tony	7
Pat	6
Glen	9
George	8
Paul	4
Mike	9
Kerry	7
Ryan	9
Simon	7
Vinny	1
	Total course participation based on activity and quality of activity in discussion forums, activity and quality of activity in quizzes, activity and quality of activity in the assignment and total hits activity in the LMS.

Appendix 21: NCEA achievement in the blended learning course

	Final Grade
Alex	Achieved
Steve	Achieved
Corbin	Achieved
David	Achieved
Donald	Achieved
William	Merit
Tony	Merit
Pat	Achieved
Glen	Excellence
George	Achieved
Paul	Achieved
Mike	Excellence
Kerry	Merit
Ryan	Achieved
Simon	Achieved
Vinny	Not Achieved

Appendix 22: Physical Education Achievement Standard 1.2 Achievement Criteria Exemplar

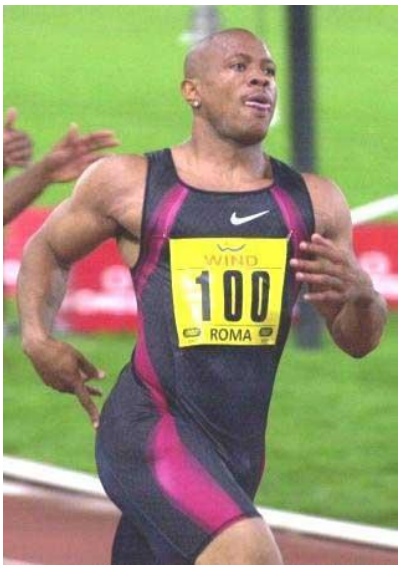
Evidence/Judgements for Achievement	Evidence/Judgements for Achievement with Merit	Evidence/Judgements for Achievement with Excellence
The student demonstrates understanding of the function of the body as it relates to the performance of physical activity. The student completes a range of suitable large muscle locomotor-type physical activities involved in sport or exercise, e.g. fitness, dance, outdoor education, games, team-based sport, or te ao kori. The student observes how their body functions in these activities. The student describes more than one characteristic of how the human body works in relation to physical activity, e.g. the way a joint moves in a specific physical activity; changes in heart rate, blood pressure. These characteristics might include, for example (where relevant to the context): basic functional anatomy, e.g. anatomical movement, bones and muscles involved in the movement, agonists, antagonists; basic principles of biomechanics, e.g. stability, force summation, levers; basic physiological responses to large muscle locomotor-type activities, e.g. acute and chronic response to training, energy systems.	The student demonstrates in-depth understanding of the function of the body as it relates to the performance of physical activity. The student completes a range of suitable large muscle locomotor-type physical activities involved in sport or exercise, e.g. fitness, dance, outdoor education, games, team-based sport, or te ao kori. The student observes how their body functions in these activities. The student gives an account of, and/or gives details of more than one characteristic of how the human body works in relation to physical activity, e.g. the way a joint moves in a specific physical activity; changes in heart rate, blood pressure. These characteristics might include, for example (where relevant to the context): basic functional anatomy, e.g. anatomical movement, bones and muscles involved in the movement, agonists, antagonists; basic principles of biomechanics, e.g. stability, force summation, levers; basic physiological responses to large muscle locomotor-type activities, e.g. acute and chronic response to training, energy systems. The student explains how and why the body functions in the manner described in performing the physical activities completed.	The student demonstrates comprehensive understanding of the function of the body as it relates to the performance of physical activity. The student completes a range of suitable large muscle locomotor-type physical activities involved in sport or exercise, e.g. fitness, dance, outdoor education, games, team-based sport, or te ao kori. The student observes how their body functions in these activities. The student gives an account of, and/or gives details of more than one characteristic of how the human body works in relation to physical activity, e.g. the way a joint moves in a specific physical activity; changes in heart rate, blood pressure. These characteristics might include, for example (where relevant to the context): basic functional anatomy, e.g. anatomical movement, bones and muscles involved in the movement, agonists, antagonists; basic principles of biomechanics, e.g. stability, force summation, levers; basic physiological responses to large muscle locomotor-type activities, e.g. acute and chronic response to training, energy systems. The student explains how and why the body functions in the manner described in performing the physical activities completed. The student shows breadth and depth of knowledge by (for example), explaining how anatomical structure affects or limits the performance of a physical activity; using biomechanical principles to explain the performance of a physical activity; explaining how physical activity and how the physiological responses (e.g. heart rate) relate to the intensity of a physical activity.

Appendix 23: Physical Education Achievement Standard 1.2 student workbook

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Achievement Standard 1.2 90963
Demonstrate understanding of the function of the body as it relates to the performance of physical activity (5 credits)

Achievement Standard 1.3 90964
Demonstrate quality movement in the performance of a physical activity
(3 credits)



NAME: _____ **CLASS:** _____

PHYSICAL EDUCATION

Introduction / Overview

This term there will be an approximate 50/50 distribution of time spent aerobically training and in class theory.
The theory consists of three sections:
Anatomy
Exercise physiology
Biomechanics
The theory components relate specifically to performance of Physical Activity.

Achievement Criteria for 1.2

Achievement	Merit	Excellence
Demonstrate understanding of the function of the body as it relates to the performance of physical activity.	Demonstrate in-depth understanding of the function of the body as it relates to the performance of physical activity.	Demonstrate comprehensive understanding of the function of the body as it relates to the performance of physical activity.

Achievement Criteria for 1.3

Achievement	**Merit**	**Excellence**
69-57 minutes	56.59-46 minutes	45.59 minutes or less

* Note: You may use grades from either your Athletics Pentathlon **or** the 10km run

Duration/Test

The practical run test will take place during exam week; week 7.
You will be tested on your theory from week three onward via a teacher interview.

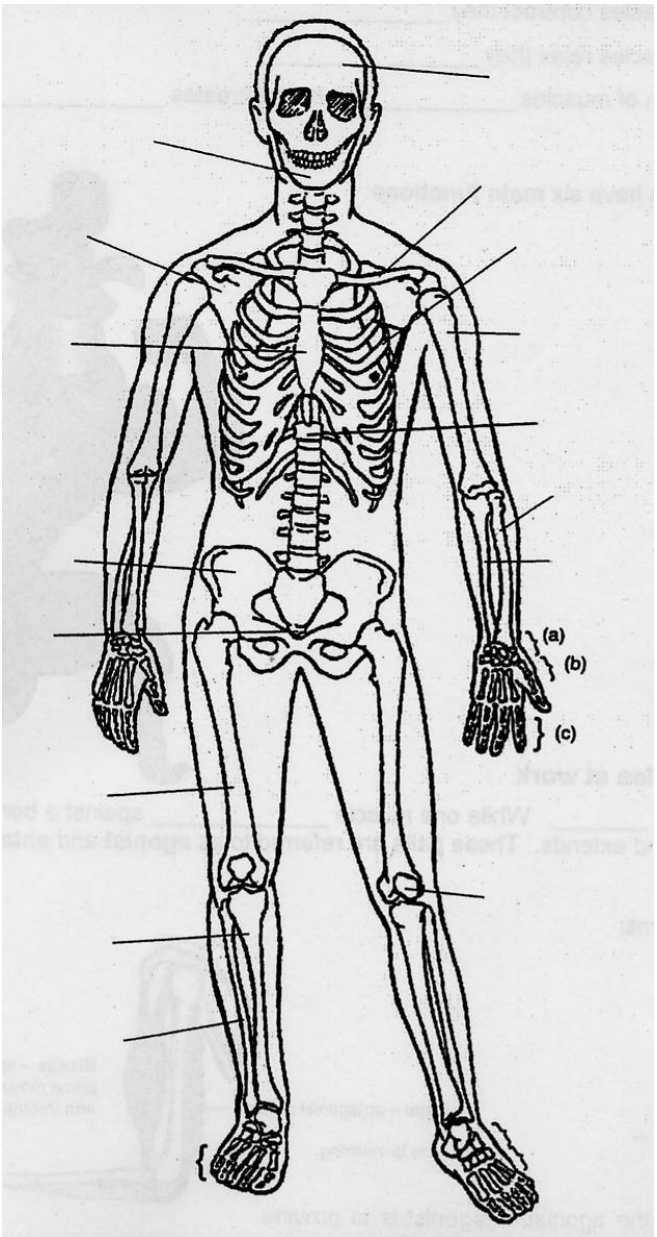
Training / Equipment

Approximately 2 periods per week will be spent training. It is expected that you will also train in your own time. You must bring the required running gear. Good running shoes are a necessity. You may wear comfortable running shorts and running shirt that are non-regulation PE gear. Many of the training runs will take place around Hagley Park. If there are any behavioural concerns while you are away from school – you will be required to run laps of the school grounds instead.

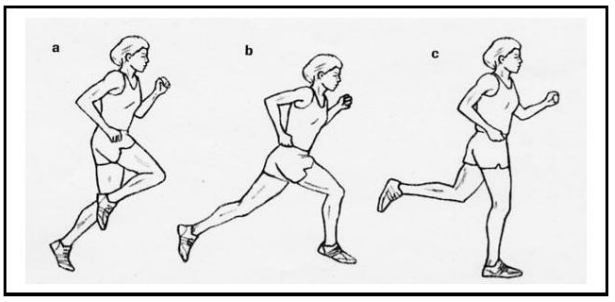
The 10km Run

The run will take place around a course in Hagley Park. This will be a one-time assessment opportunity. You will need to produce a medical certificate if you do not participate.

Bones and Muscles involved in movement.
The types of movements occurring at joints.
Understand agonist and antagonist muscles.
How muscles and movements help your performance.



Which bones play a critical role for runners?

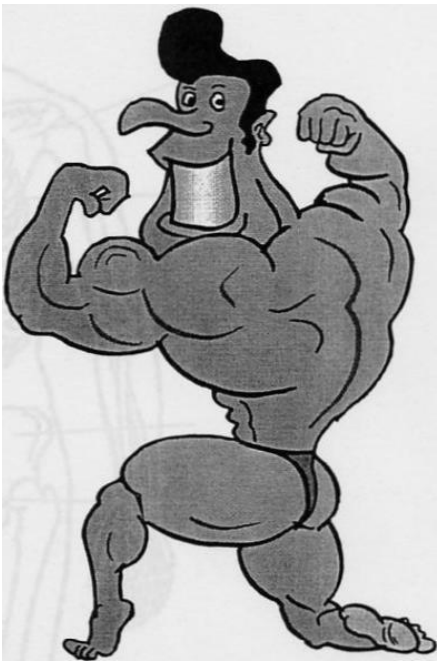


2. Skeletal Muscles

- Skeletal muscle comprises just over one-third of the total body mass.
- Muscles are joined to bones by _____
- When muscles contract they _____
- When muscles relax they _____
- The action of muscles _____on bones creates _____at joints

Skeletal muscles have six **main functions:**

1.
2.
3.
4.
5.
6.



Skeletal muscles at work

Muscles work in pairs. While one muscle contracts against a bone the other _____and extends. These pairs are referred to as **agonist** and **antagonist.**

Define these terms:

- Agonist –
- Antagonist –
- Prime mover-

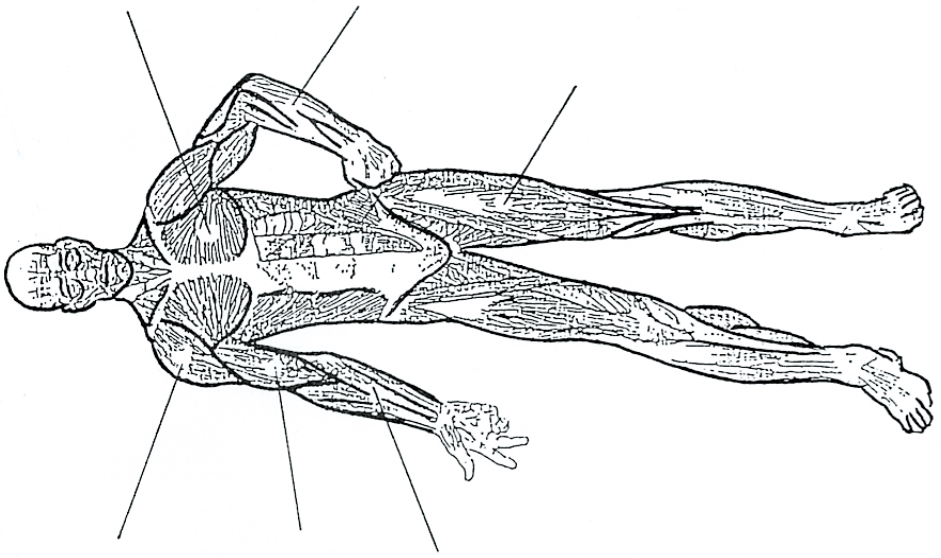
Biceps – agonist action. The prime mover in raising the lower arm through contraction.

Triceps -antagonist action. Muscle is relaxing,

The purpose of the agonist/antagonist is to previae control of movement in opposite directions about a joint.

The Major Muscles:

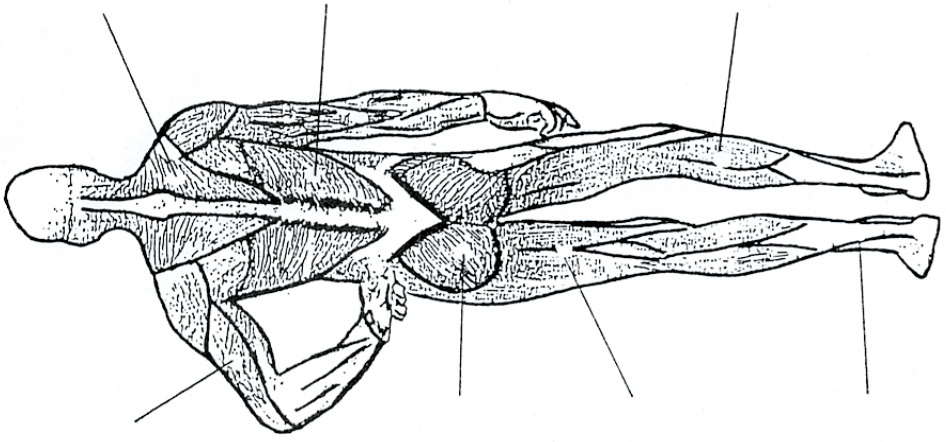
LABEL THESE MUSCLES



Anterior View

List of Muscles

Pectorals
Quadriceps
Gluteus Maximus
Latissimus Dorsi
Deltoids
Tricep
Trapezius
Hamstrings
Gastrocnemius
Bicep
Wrist flexors
Soleus
Wrist extensors



Posterior View

Review question:
Which muscles play a critical role for runners?

<u>Flexion:</u> Flexion is bending – decreasing the angle between two bones.

Draw stick figure diagrams of flexion:

At the knee:

At the elbow:

At the trunk:

At the Hip:

<u>Extension:</u> Extension is the increasing of an angle between two bones.

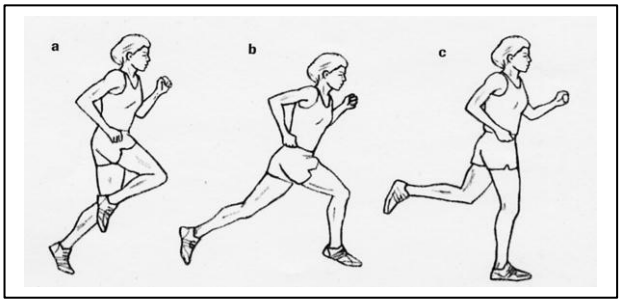
Draw stick figure diagrams of extension:

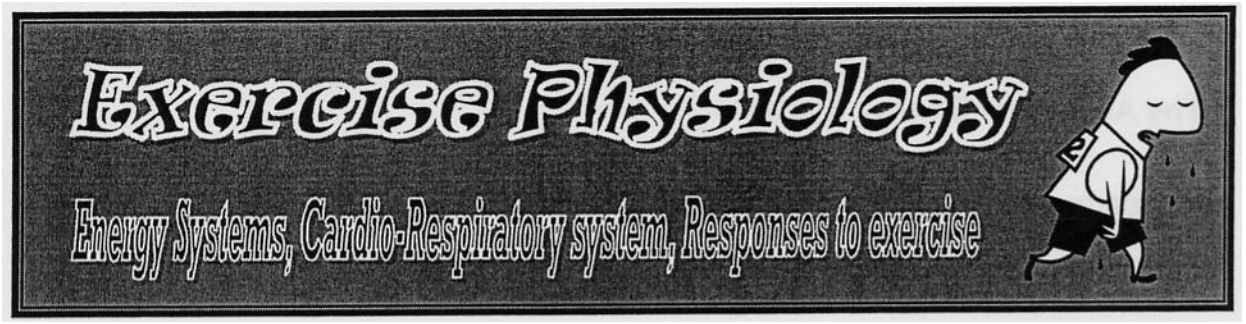
At the trunk: eg. Sit-ups

At the knee:

At the shoulder:

Review question:
What movements does a runner repeat most often?





What are the energy systems used running and how does it works.
Explain the short and long-term physiological responses to your body after and during exercise.

When you exercise, your muscles act something like electric motors. An electric motor uses electricity for energy. Your muscles are motors that use a chemical called Adenosine Tri-Phosphate (ATP) for energy.
During the process of "burning" ATP, your muscles need three things:

Oxygen, because chemical reactions require ATP
To get rid of wastes (carbon dioxide, lactic acid) that the working muscles make.
To get rid of heat. Just like an electric motor, a working muscle warms up and needs to cool off.

In order to keep your muscles working, your must continuously make ATP. To do this, your body must supply oxygen to the muscles and get rid of the waste products and heat. The harder the exercise, the more waste and more heat. If these needs are not met, then, you become exhausted and you won't be able to keep exercising.

Because ATP is so important, the body has several different systems to create ATP. These systems work together in phases. The interesting thing is that different forms of exercise use different systems, so a sprinter is getting ATP in a completely different way from a marathon runner!
ATP comes from three different systems in the muscle, in this order:
ATP system
Anaerobic Lactic Acid system
Aerobic respiration

Now, let's look at each one in detail.

1. ATP CP System
A muscle cell has some amount of ATP floating around that it can use immediately, but not very much -- only enough to last for about 8-10 seconds. Sprinters primarily use this system.

2. Anaerobic-Lactic Acid System
Muscles also have big reserves of **glycogen**. (Glycogen comes from sugar.) This Glycogen makes ATP. Unfortunately as ATP is produced **lactic acid** is also produced. This acid is what makes your muscles hurt.
The system can produce enough ATP to last about 90 seconds. This system does not need oxygen.

3. Aerobic Respiration system

After about two minutes of exercise, the body responds to supply working muscles with oxygen. When oxygen is present, glycogen can make ATP without forming Lactic Acid.

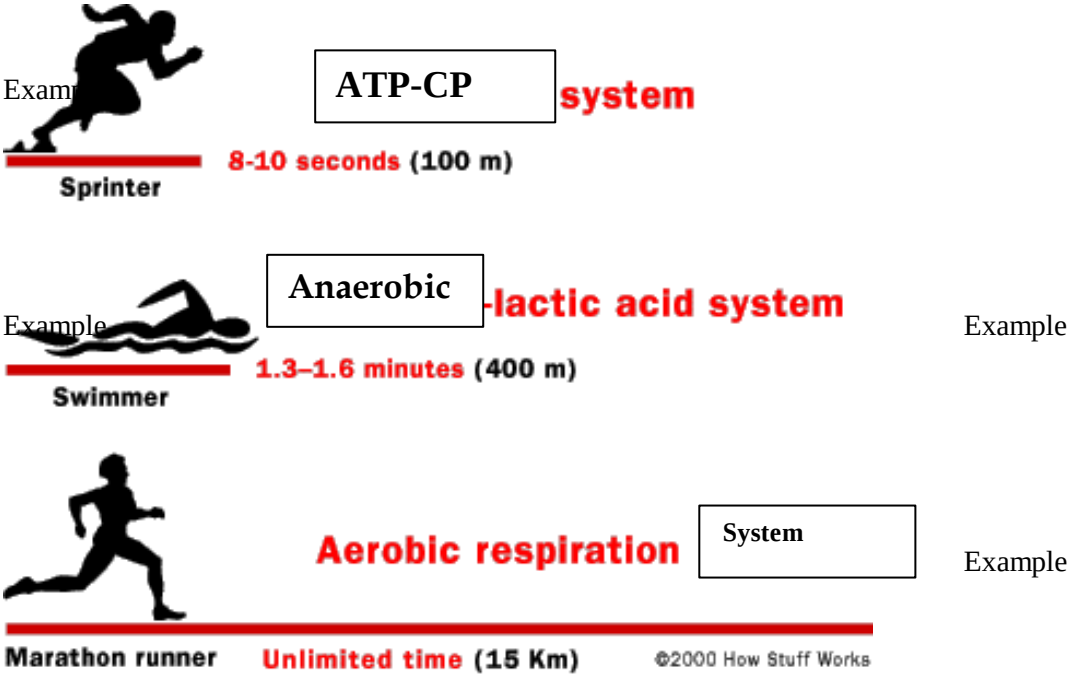
Aerobic respiration produces ATP at the slowest rate of the three systems, but it can continue to supply ATP for several hours or longer.

Complete the following table:

Energy System	Source	Intensity	Duration	Example
ATP -CP			Less than 10 secs	
	Glycogen			
		Low		

Runners Take Your Mark

So imagine that you start running. Here's what happens:
The muscle cells burn off the ATP they have floating around in about 3 seconds.
The ATP system kicks in and supplies energy for up to 10 seconds. This would be the major energy system used by the muscles of a 100-meter sprinter or weight lifter, where rapid acceleration, short-duration exercise occurs.
If exercise continues longer, then the Anaerobic-lactic acid system kicks in. This would be true for short-distance exercises such as a 200- or 400-metre dash or 100-metre swim.
Finally, if exercise continues, then aerobic respiration takes over. This would occur in endurance events such as an 800-metre dash, marathon run, rowing, cross-country skiing and distance skating.
When you start to look closely at how the human body works, it is truly an amazing machine!
Give examples of athletes who would primarily use the above systems.



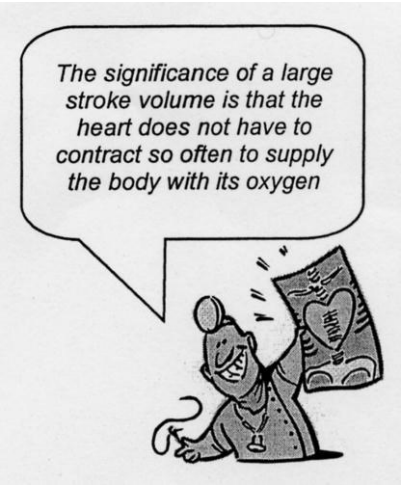
Question

Explain what happens with the energy systems while a person is completing a 3 km ocean swim?

In order for the body to carry out exercise it needs to transport oxygen to, and by-products from the working muscles through the blood stream. The heart, lungs and circulatory system perform this.

Features of the Circulatory and respiratory Systems

Understand Cardiac Output



Cardiac Output (Q) is:

Heart Rate (HR) is:

Stroke Volume (SV) is:

Cardiac Output is measured by:

Getting Oxygen to the Cells

If you are going to be exercising for more than a couple of minutes, your body needs to get oxygen to the muscles or the muscles will stop working. Your body has several ways to increase the flow of oxygen-rich blood to working muscle:

1. Increasing Blood Flow to the working muscle

Making the Pipe Bigger

As you exercise, the blood vessels in your muscles dilate and the blood flow is greater, just as more water flows through a fire hose than through a garden hose. This is called **vasodilation**. The increased blood flow delivers more oxygenated blood to the working muscle.

2. Diversion

As you begin to exercise, blood from organs is diverted to the muscles, taking blood from the organs. When you begin to exercise, a remarkable diversion happens. Blood that would have gone to the stomach or the kidneys goes instead to the muscles.

3. Making the Heart Pump Harder

The heart's blood flow increases by about four or five times from that of its resting state. Your body does this by increasing the rate of your heartbeat and the amount of blood that comes through the heart and goes out to the rest of the body.

4. Breathing Faster and Deeper

So far, we have talked about getting more blood to working muscle. Your lungs and the rest of your respiratory system need to provide more oxygen for the blood, too. The rate and depth of your breathing also increase with an increase in exercise.

These mechanisms can increase the blood flow to your working muscle by almost five times.

Heating Up

Your body heats up when you exercise, and it will show on your skin. Your skin feels hotter to the touch and may look red, and you sweat. These are actually the ways that the body cools itself.
The heat produced by exercising muscle causes an increase of blood flow to the skin. This increased blood flow to the skin and the large surface area of the skin allows the excess heat to be lost to the surrounding air.
The brain also stimulates sweat glands in the skin to produce sweat. The sweat evaporates from the skin, removing heat and cooling the body. Evaporation of sweat removes fluid from the body, so it is important to maintain fluids for blood flow and sweat production by drinking water and/or sport drinks.

Short - term Cardio-respiratory responses to exercise:

Heart Rate:

Cardiac Output:

Circulatory System:

Ventilatory action:

Vital capacity:

Temperature control:

Long - term Cardio-respiratory responses to exercise:

Heart and circulatory system

Cardiac Output:

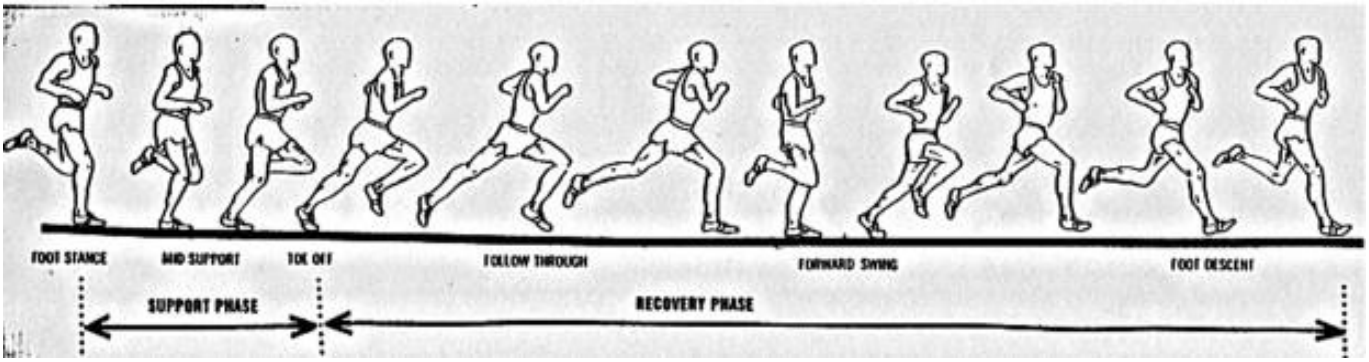
Resting pulse rate:

Recovery:

Respiratory function:

Muscular function:

Force summation and how it applies to running
Newton's Laws of Motion and how they apply to running



Force summation

The combination of forces produced by different parts of the human body. When a person is moving or attempting to move an object, several different parts of the body act together to maximize the force. In theory, force summation occurs when all body parts act simultaneously.

Draw a picture/list the muscles involved with force summation when serving a tennis ball.

Newtons Laws of Motion
Sir Isaac Newton, 1642 - 1727, was an English mathematician, physicist, astronomer and philosopher. He was particularly noted for his discovery of the law of gravity and three laws of motion. Newton's three laws of motion explain what caused the body to move the way that it does.

Newtons 1st Law of Motion - Inertia
Inertia is an object's resistance to change in its movement.

The amount of inertia an object has depends on its mass. The greater the mass the greater the force required to overcome the inertia - causing change in motion
An object at rest tends to remain at rest unless acted upon by an external force

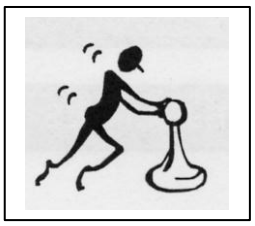
Newtons 2nd Law of Motion - Acceleration

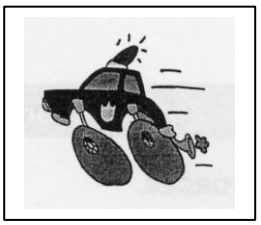
For a constant mass - the bigger the force, the greater the acceleration
Force = Mass x Acceleration

Newtons 3rd Law of Motion - Action - Reaction

The first force applied is the action and the opposing force is the reaction
For every action there is an equal and opposite reaction.

Review question:





With reference to Newton's first law how does body type affect an athletes running ability?

With reference to Newton's second law how does an athlete's strength and power affect running ability?

With reference to Newton's third law how does the surface an athlete is running on affect their running ability?